



Full wwPDB X-ray Structure Validation Report ⓘ

Apr 18, 2026 – 04:46 PM UTC

PDB ID : 4HPG / pdb_00004hpg
Title : Crystal structure of a glycosylated beta-1,3-glucanase (HEV B 2), an allergen from Hevea brasiliensis
Authors : Rodriguez-Romero, A.; Hernandez-Santoyo, A.
Deposited on : 2012-10-23
Resolution : 2.54 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
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

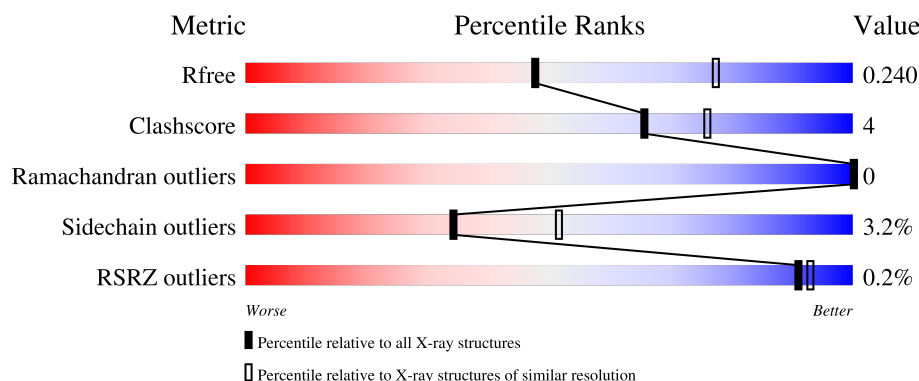
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

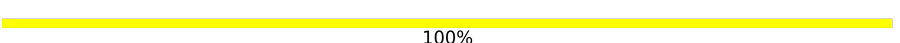
The reported resolution of this entry is 2.54 Å.

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	1091 (2.54-2.54)
Clashscore	190562	1120 (2.54-2.54)
Ramachandran outliers	187476	1106 (2.54-2.54)
Sidechain outliers	187428	1106 (2.54-2.54)
RSRZ outliers	180081	1091 (2.54-2.54)

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	316	 88% 11% .
1	B	316	 89% 11%
1	C	316	 85% 13% .
1	D	316	 84% 15% .
2	E	2	 100%

Continued on next page...

Continued from previous page...

Mol	Chain	Length	Quality of chain
2	F	2	50% 50%

2 Entry composition [i](#)

There are 5 unique types of molecules in this entry. The entry contains 10207 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 Beta-1,3-glucanase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	316	Total	C	N	O	S	0	0	0
			2477	1590	428	454	5			
1	B	316	Total	C	N	O	S	0	0	0
			2491	1598	433	455	5			
1	C	316	Total	C	N	O	S	0	0	0
			2477	1589	428	455	5			
1	D	316	Total	C	N	O	S	0	0	0
			2493	1599	435	454	5			

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



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

- Molecule 3 is DI(HYDROXYETHYL)ETHER (CCD ID: PEG) (formula: C₄H₁₀O₃).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	C	O	0	0
			7	4	3		
3	C	1	Total	C	O	0	0
			7	4	3		

- Molecule 4 is 2-acetamido-2-deoxy-beta-D-glucopyranose (CCD ID: NAG) (formula: $C_8H_{15}NO_6$).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
4	C	1	Total	C	N	O	0	0
			14	8	1	5		

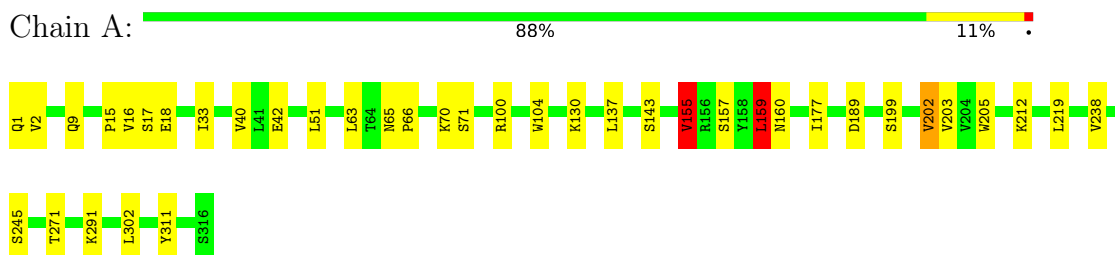
- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	60	Total 60	O 60	0	0
5	B	51	Total 51	O 51	0	0
5	C	45	Total 45	O 45	0	0
5	D	37	Total 37	O 37	0	0

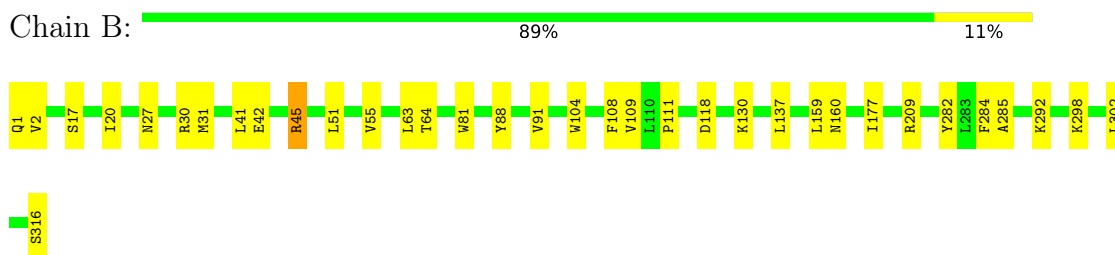
3 Residue-property plots [i](#)

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.

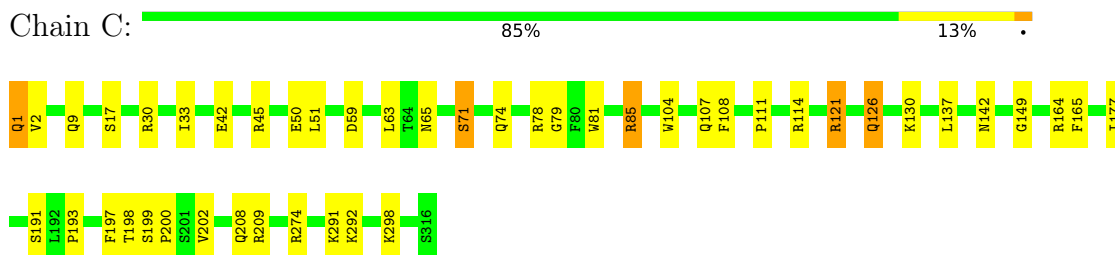
- Molecule 1: Beta-1,3-glucanase



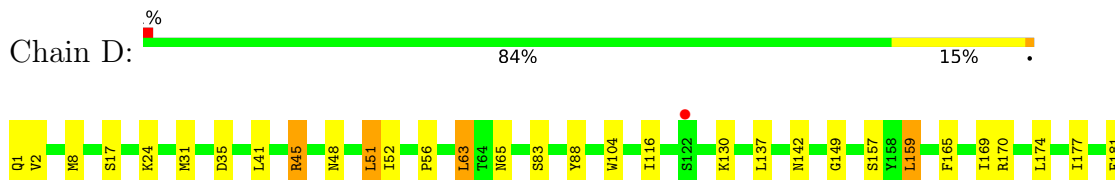
- Molecule 1: Beta-1,3-glucanase



- Molecule 1: Beta-1,3-glucanase



- Molecule 1: Beta-1,3-glucanase





- Molecule 2: α -L-fucopyranose-(1-3)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain E:

100%



- Molecule 2: α -L-fucopyranose-(1-3)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain F:

50%

50%



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	87.18Å 89.78Å 101.54Å 90.00° 113.59° 90.00°	Depositor
Resolution (Å)	25.21 – 2.54 25.21 – 2.54	Depositor EDS
% Data completeness (in resolution range)	97.1 (25.21-2.54) 95.3 (25.21-2.54)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.58 (at 2.54Å)	Xtriage
Refinement program	PHENIX (phenix.refine: 1.8.1_1168)	Depositor
R, R_{free}	0.193 , 0.240 0.195 , 0.240	Depositor DCC
R_{free} test set	1880 reflections (3.94%)	wwPDB-VP
Wilson B-factor (Å ²)	34.7	Xtriage
Anisotropy	0.647	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.31 , 23.4	EDS
L-test for twinning ²	$\langle L \rangle = 0.47$, $\langle L^2 \rangle = 0.30$	Xtriage
Estimated twinning fraction	0.027 for h,-k,-h-l	Xtriage
F_o, F_c correlation	0.93	EDS
Total number of atoms	10207	wwPDB-VP
Average B, all atoms (Å ²)	35.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.16% 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

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: NAG, PEG, PCA, FUC

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	0.68	0/2535	1.06	6/3454 (0.2%)
1	B	0.64	0/2549	0.98	6/3470 (0.2%)
1	C	0.71	0/2535	1.06	11/3455 (0.3%)
1	D	0.70	0/2551	1.09	5/3472 (0.1%)
All	All	0.68	0/10170	1.05	28/13851 (0.2%)

There are no bond length outliers.

All (28) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	159	LEU	N-CA-C	7.81	119.87	111.36
1	B	160	ASN	CA-C-N	-6.97	112.52	119.56
1	B	160	ASN	C-N-CA	-6.97	112.52	119.56
1	A	155	VAL	N-CA-CB	-6.89	103.40	112.36
1	C	79	GLY	N-CA-C	-6.57	107.44	114.67
1	D	159	LEU	N-CA-C	6.48	118.42	111.36
1	C	81	TRP	N-CA-C	6.29	118.95	111.71
1	C	199	SER	CA-C-N	6.12	125.53	118.85
1	C	199	SER	C-N-CA	6.12	125.53	118.85
1	B	302	LEU	N-CA-C	-5.95	106.18	113.50
1	C	202	VAL	N-CA-C	5.78	117.96	109.63
1	D	65	ASN	CA-C-N	5.75	124.95	118.97
1	D	65	ASN	C-N-CA	5.75	124.95	118.97
1	D	51	LEU	N-CA-C	5.70	118.19	108.90
1	A	302	LEU	N-CA-C	-5.61	106.61	113.50
1	A	203	VAL	N-CA-C	-5.56	107.40	112.96
1	B	51	LEU	N-CA-C	5.38	117.67	108.90
1	D	302	LEU	N-CA-C	-5.38	106.89	113.50
1	C	274	ARG	CA-C-N	5.32	126.48	119.84
1	C	274	ARG	C-N-CA	5.32	126.48	119.84

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	109	VAL	N-CA-C	5.30	115.44	110.30
1	B	159	LEU	N-CA-C	5.26	117.10	111.36
1	C	65	ASN	CA-C-N	5.15	124.77	119.05
1	C	65	ASN	C-N-CA	5.15	124.77	119.05
1	C	197	PHE	CA-C-N	-5.11	114.63	122.60
1	C	197	PHE	C-N-CA	-5.11	114.63	122.60
1	A	160	ASN	CA-C-N	-5.08	114.44	119.56
1	A	160	ASN	C-N-CA	-5.08	114.44	119.56

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	2477	0	2440	19	0
1	B	2491	0	2467	16	0
1	C	2477	0	2433	20	0
1	D	2493	0	2473	27	0
2	E	24	0	22	0	0
2	F	24	0	22	0	0
3	A	7	0	9	0	0
3	C	7	0	10	0	0
4	C	14	0	13	0	0
5	A	60	0	0	0	0
5	B	51	0	0	2	0
5	C	45	0	0	1	0
5	D	37	0	0	1	0
All	All	10207	0	9889	76	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 4.

All (76) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:137:LEU:HD11	1:A:177:ILE:HG12	1.74	0.68
1:C:121:ARG:HG3	1:C:126:GLN:HG2	1.77	0.65
1:C:137:LEU:HD11	1:C:177:ILE:HG12	1.78	0.65
1:A:15:PRO:HG2	1:A:18:GLU:HG3	1.79	0.64
1:C:104:TRP:H	1:C:104:TRP:CD1	2.15	0.64
1:D:188:ARG:NH2	1:D:189:ASP:OD1	2.32	0.62
1:C:71:SER:HB3	1:D:253:PHE:CD1	2.38	0.59
1:D:202:VAL:HG21	1:D:205:TRP:CZ2	2.38	0.58
1:D:104:TRP:H	1:D:104:TRP:CD1	2.22	0.57
1:A:157:SER:OG	1:D:189:ASP:OD2	2.21	0.56
1:D:45:ARG:HG2	1:D:83:SER:HB2	1.88	0.56
1:A:245:SER:HB3	1:A:311:TYR:OH	2.06	0.55
1:D:137:LEU:HD11	1:D:177:ILE:HG12	1.88	0.55
1:B:137:LEU:HD11	1:B:177:ILE:HG12	1.88	0.55
1:C:42:GLU:O	1:C:45:ARG:HG3	2.08	0.54
1:A:66:PRO:O	1:A:70:LYS:HG3	2.08	0.54
1:C:74:GLN:NE2	1:C:78:ARG:HD3	2.23	0.53
1:C:292:LYS:O	1:C:298:LYS:NZ	2.32	0.53
1:B:292:LYS:O	1:B:298:LYS:HE3	2.09	0.52
1:B:104:TRP:CD1	1:B:104:TRP:H	2.26	0.52
1:B:42:GLU:O	1:B:45:ARG:HG3	2.09	0.52
1:C:198:THR:O	1:C:200:PRO:HD3	2.10	0.51
1:A:104:TRP:CD1	1:A:104:TRP:H	2.26	0.51
1:D:292:LYS:O	1:D:298:LYS:NZ	2.42	0.51
1:A:177:ILE:HD12	1:A:238:VAL:HG22	1.94	0.49
1:A:199:SER:O	1:A:212:LYS:NZ	2.29	0.49
1:B:27:ASN:HD22	1:B:316:SER:HG	1.57	0.48
1:D:52:ILE:HD13	1:D:174:LEU:HD21	1.95	0.48
1:D:200:PRO:O	1:D:212:LYS:NZ	2.45	0.47
1:C:59:ASP:OD2	5:C:534:HOH:O	2.20	0.47
1:C:114:ARG:HG2	1:C:165:PHE:CE1	2.50	0.47
1:B:209:ARG:NH1	5:B:516:HOH:O	2.45	0.47
1:D:205:TRP:CD1	5:D:410:HOH:O	2.67	0.47
1:A:104:TRP:HZ2	1:D:294:PRO:HG3	1.81	0.46
1:C:1:PCA:HG2	1:C:30:ARG:CZ	2.46	0.46
1:C:1:PCA:HG2	1:C:30:ARG:NH1	2.31	0.45
1:A:189:ASP:OD2	1:D:157:SER:OG	2.28	0.45
1:D:45:ARG:HG2	1:D:83:SER:CB	2.46	0.45
1:D:159:LEU:HA	1:D:159:LEU:HD23	1.72	0.45
1:A:219:LEU:HD23	1:A:271:THR:HG21	2.00	0.44
1:A:155:VAL:HG13	1:A:159:LEU:HD22	2.00	0.43
1:C:9:GLN:C	1:C:291:LYS:HD3	2.43	0.43

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:55:VAL:HB	1:B:91:VAL:HA	2.00	0.43
1:B:20:ILE:HD13	1:B:31:MET:HE1	1.99	0.43
1:D:270:GLY:HA3	1:D:274:ARG:O	2.19	0.43
1:C:33:ILE:HG12	1:C:51:LEU:HD11	2.00	0.43
1:B:118:ASP:OD2	5:B:549:HOH:O	2.21	0.43
1:C:142:ASN:O	1:C:149:GLY:HA2	2.19	0.43
1:B:88:TYR:HD1	1:B:130:LYS:HB2	1.84	0.43
1:C:191:SER:HB2	1:C:193:PRO:HD2	2.01	0.42
1:D:142:ASN:O	1:D:149:GLY:HA2	2.19	0.42
1:A:9:GLN:C	1:A:291:LYS:HD2	2.44	0.42
1:A:33:ILE:HG12	1:A:51:LEU:HD11	2.01	0.42
1:B:81:TRP:HH2	1:D:8:MET:HE1	1.82	0.42
1:B:30:ARG:HB3	1:B:282:TYR:CE1	2.55	0.42
1:A:65:ASN:HA	1:A:66:PRO:HD3	1.91	0.42
1:A:130:LYS:HD3	1:A:130:LYS:HA	1.86	0.42
1:D:130:LYS:HD3	1:D:130:LYS:HA	1.73	0.42
1:B:284:PHE:HA	1:B:285:ALA:HA	1.92	0.42
1:A:100:ARG:HG3	1:D:181:PHE:CZ	2.55	0.41
1:C:50:GLU:HG2	1:C:85:ARG:HD2	2.01	0.41
1:C:130:LYS:HD3	1:C:130:LYS:HA	1.82	0.41
1:C:74:GLN:HE21	1:C:74:GLN:HB2	1.71	0.41
1:D:257:ARG:HB2	1:D:311:TYR:CD1	2.55	0.41
1:B:41:LEU:HD23	1:B:41:LEU:HA	1.94	0.41
1:C:108:PHE:C	1:C:111:PRO:HD2	2.45	0.41
1:D:88:TYR:OH	1:D:280:GLU:OE1	2.37	0.41
1:D:35:ASP:CB	1:D:56:PRO:HG3	2.51	0.41
1:D:31:MET:O	1:D:51:LEU:HD12	2.20	0.41
1:D:165:PHE:CE2	1:D:169:ILE:HD13	2.56	0.41
1:A:16:VAL:HG11	1:A:40:VAL:HA	2.03	0.40
1:A:202:VAL:HG21	1:A:205:TRP:CE2	2.56	0.40
1:B:108:PHE:C	1:B:111:PRO:HD2	2.46	0.40
1:D:63:LEU:HD23	1:D:116:ILE:HD11	2.03	0.40
1:B:64:THR:HG22	1:B:111:PRO:HB2	2.03	0.40
1:D:41:LEU:HD23	1:D:41:LEU:HA	1.92	0.40

There are no symmetry-related clashes.

5.3 Torsion angles [i](#)

5.3.1 Protein backbone [i](#)

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

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

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	314/316 (99%)	307 (98%)	7 (2%)	0	100	100
1	B	314/316 (99%)	307 (98%)	7 (2%)	0	100	100
1	C	314/316 (99%)	308 (98%)	6 (2%)	0	100	100
1	D	314/316 (99%)	308 (98%)	6 (2%)	0	100	100
All	All	1256/1264 (99%)	1230 (98%)	26 (2%)	0	100	100

There are no Ramachandran outliers to report.

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	264/268 (98%)	255 (97%)	9 (3%)	32	48
1	B	267/268 (100%)	263 (98%)	4 (2%)	57	74
1	C	264/268 (98%)	253 (96%)	11 (4%)	26	40
1	D	267/268 (100%)	257 (96%)	10 (4%)	30	45
All	All	1062/1072 (99%)	1028 (97%)	34 (3%)	34	51

All (34) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	2	VAL
1	A	17	SER

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
1	A	42	GLU
1	A	63	LEU
1	A	71	SER
1	A	143	SER
1	A	155	VAL
1	A	159	LEU
1	A	202	VAL
1	B	2	VAL
1	B	17	SER
1	B	45	ARG
1	B	63	LEU
1	C	2	VAL
1	C	17	SER
1	C	63	LEU
1	C	71	SER
1	C	85	ARG
1	C	107	GLN
1	C	121	ARG
1	C	126	GLN
1	C	164	ARG
1	C	208	GLN
1	C	209	ARG
1	D	2	VAL
1	D	17	SER
1	D	24	LYS
1	D	45	ARG
1	D	48	ASN
1	D	63	LEU
1	D	170	ARG
1	D	199	SER
1	D	277	ARG
1	D	316	SER

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (9) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	48	ASN
1	A	117	HIS
1	A	255	ASN
1	A	312	ASN
1	B	38	GLN
1	B	265	GLN

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
1	C	117	HIS
1	C	128	GLN
1	D	107	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

4 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
1	PCA	B	1	1	7,8,9	2.05	1 (14%)	9,10,12	3.15	5 (55%)
1	PCA	C	1	1	7,8,9	2.11	1 (14%)	9,10,12	2.32	5 (55%)
1	PCA	D	1	1	7,8,9	2.08	1 (14%)	9,10,12	2.28	5 (55%)
1	PCA	A	1	1	7,8,9	1.89	1 (14%)	9,10,12	2.11	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. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
1	PCA	B	1	1	-	0/0/11/13	0/1/1/1
1	PCA	C	1	1	-	0/0/11/13	0/1/1/1
1	PCA	D	1	1	-	0/0/11/13	0/1/1/1
1	PCA	A	1	1	-	0/0/11/13	0/1/1/1

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	C	1	PCA	CD-N	5.42	1.48	1.34
1	D	1	PCA	CD-N	5.24	1.47	1.34
1	B	1	PCA	CD-N	5.21	1.47	1.34
1	A	1	PCA	CD-N	4.88	1.46	1.34

All (19) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	1	PCA	CB-CA-C	-6.11	104.27	112.66
1	B	1	PCA	OE-CD-CG	-3.94	119.69	126.72
1	C	1	PCA	CB-CA-C	-3.39	108.01	112.66
1	B	1	PCA	CA-N-CD	-3.38	102.00	113.58
1	A	1	PCA	CA-N-CD	-3.30	102.28	113.58
1	D	1	PCA	OE-CD-CG	-3.15	121.10	126.72
1	A	1	PCA	CB-CA-N	3.14	111.89	103.24
1	C	1	PCA	CA-N-CD	-3.11	102.92	113.58
1	B	1	PCA	CG-CD-N	3.09	115.96	108.39
1	C	1	PCA	OE-CD-CG	-3.04	121.29	126.72
1	D	1	PCA	CB-CA-C	-2.95	108.61	112.66
1	A	1	PCA	CG-CD-N	2.94	115.59	108.39
1	B	1	PCA	CB-CA-N	2.94	111.33	103.24
1	D	1	PCA	CA-N-CD	-2.87	103.76	113.58
1	C	1	PCA	CB-CA-N	2.86	111.11	103.24
1	D	1	PCA	CG-CD-N	2.57	114.67	108.39
1	D	1	PCA	CB-CA-N	2.54	110.23	103.24
1	C	1	PCA	CG-CD-N	2.48	114.45	108.39
1	A	1	PCA	OE-CD-CG	-2.14	122.89	126.72

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

1 monomer is involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
1	C	1	PCA	2	0

5.5 Carbohydrates

4 monosaccharides are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
2	NAG	E	1	1,2	14,14,15	1.01	1 (7%)	17,19,21	0.82	1 (5%)
2	FUC	E	2	2	10,10,11	1.52	2 (20%)	14,14,16	1.11	1 (7%)
2	NAG	F	1	1,2	14,14,15	0.38	0	17,19,21	0.60	0
2	FUC	F	2	2	10,10,11	1.52	2 (20%)	14,14,16	1.10	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
2	NAG	E	1	1,2	-	0/6/23/26	0/1/1/1
2	FUC	E	2	2	-	-	0/1/1/1
2	NAG	F	1	1,2	-	0/6/23/26	0/1/1/1
2	FUC	F	2	2	-	-	0/1/1/1

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	E	1	NAG	O5-C1	3.58	1.49	1.43
2	E	2	FUC	C2-C3	3.24	1.57	1.52
2	F	2	FUC	O5-C5	2.84	1.49	1.43
2	E	2	FUC	O5-C5	2.57	1.48	1.43
2	F	2	FUC	C4-C3	2.47	1.58	1.52

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	E	2	FUC	O3-C3-C4	-2.77	103.85	110.38
2	E	1	NAG	C1-O5-C5	2.52	115.57	112.19

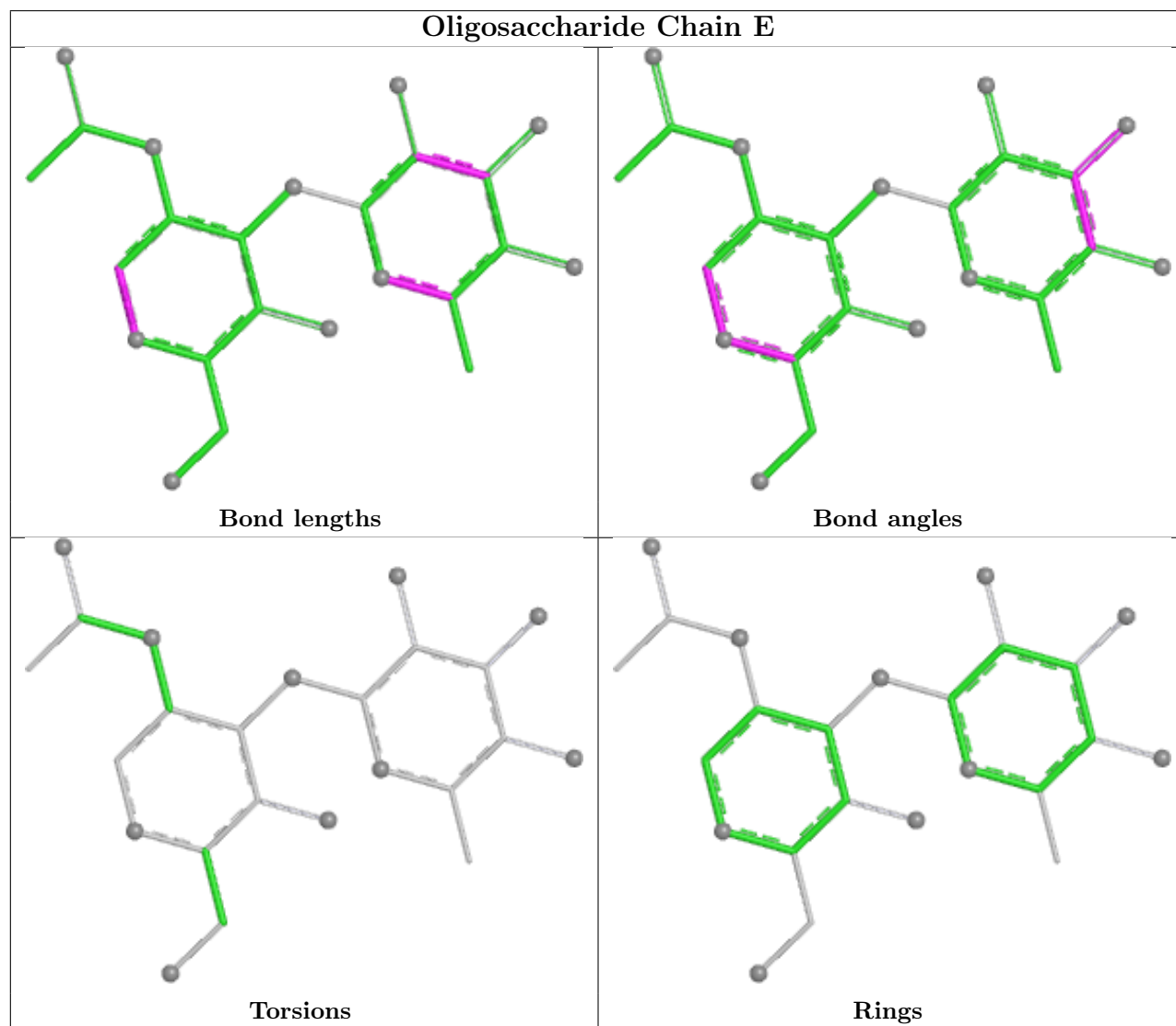
There are no chirality outliers.

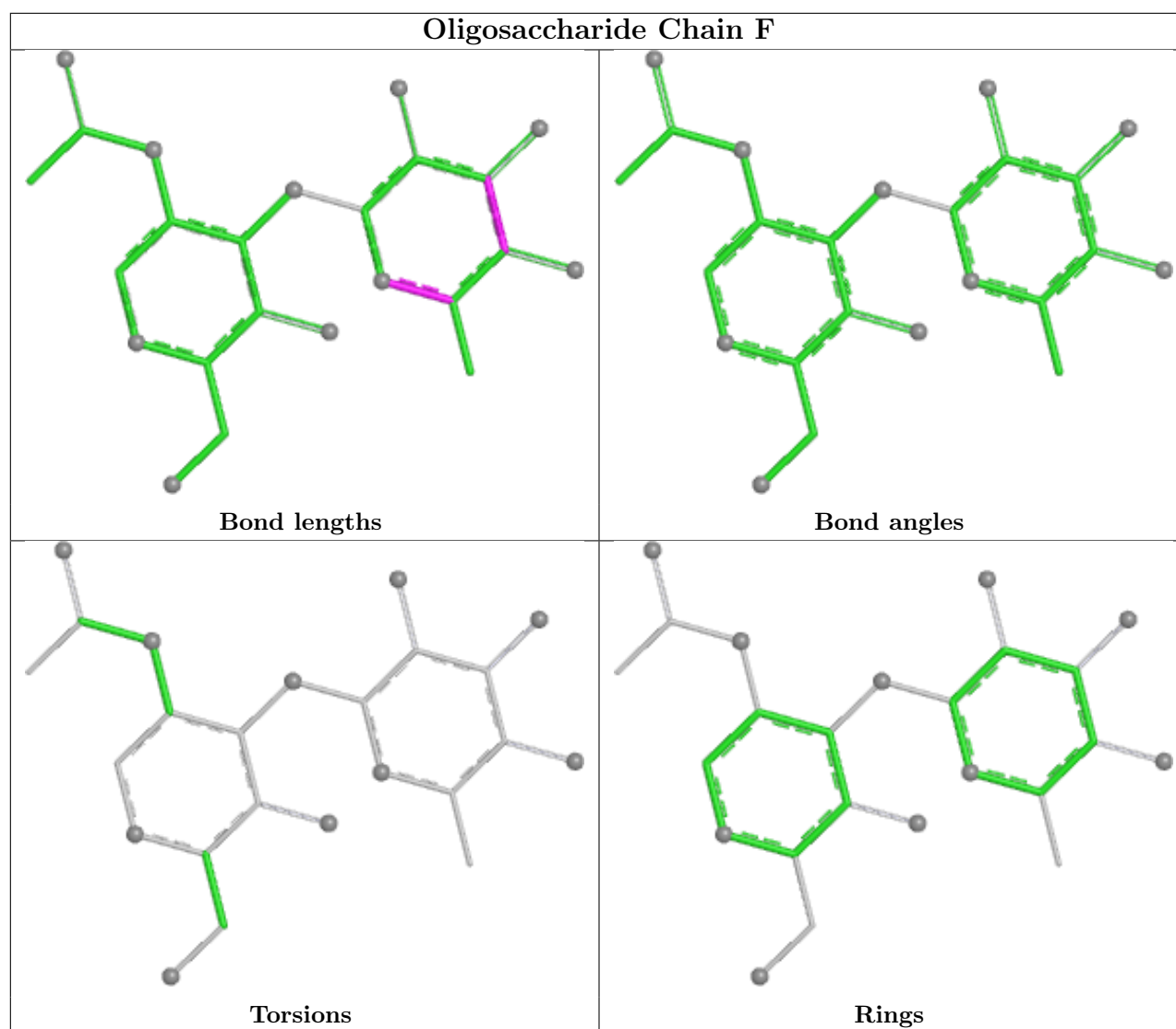
There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

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





5.6 Ligand geometry [i](#)

3 ligands are modelled in this entry.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
3	PEG	A	401	-	6,6,6	0.51	0	5,5,5	0.38	0
4	NAG	C	403	1	14,14,15	0.95	1 (7%)	17,19,21	1.18	1 (5%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
3	PEG	C	404	-	6,6,6	0.71	0	5,5,5	0.73	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	PEG	A	401	-	-	3/4/4/4	-
4	NAG	C	403	1	-	0/6/23/26	0/1/1/1
3	PEG	C	404	-	-	2/4/4/4	-

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	C	403	NAG	O5-C1	3.30	1.49	1.43

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	C	403	NAG	C1-O5-C5	3.77	117.23	112.19

There are no chirality outliers.

All (5) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	401	PEG	O1-C1-C2-O2
3	A	401	PEG	O2-C3-C4-O4
3	C	404	PEG	C4-C3-O2-C2
3	A	401	PEG	C1-C2-O2-C3
3	C	404	PEG	C1-C2-O2-C3

There are no ring outliers.

No monomer is involved in short contacts.

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 [i](#)

6.1 Protein, DNA and RNA chains [i](#)

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	315/316 (99%)	-0.15	0	100 100	21, 32, 45, 54	0
1	B	315/316 (99%)	-0.34	0	100 100	23, 32, 46, 57	0
1	C	315/316 (99%)	-0.07	0	100 100	24, 35, 52, 62	0
1	D	315/316 (99%)	0.15	3 (0%)	79 80	26, 40, 53, 59	0
All	All	1260/1264 (99%)	-0.10	3 (0%)	91 93	21, 34, 50, 62	0

All (3) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	122	SER	2.2
1	D	210	GLY	2.2
1	D	205	TRP	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, 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.

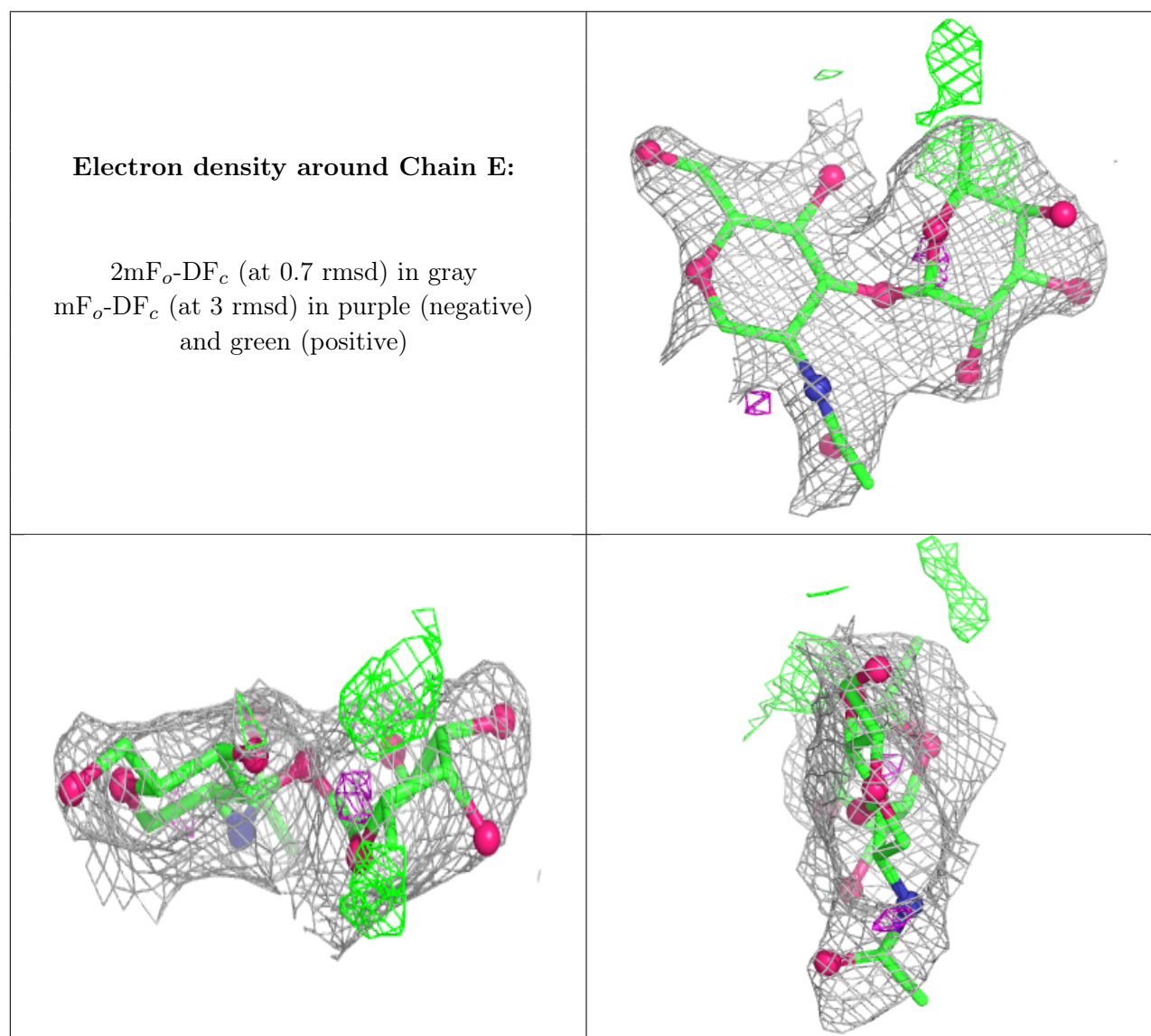
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
1	PCA	A	1	8/9	0.87	0.10	34,40,41,51	0
1	PCA	B	1	8/9	0.90	0.11	34,37,39,45	0
1	PCA	C	1	8/9	0.90	0.10	42,45,50,54	0
1	PCA	D	1	8/9	0.90	0.09	39,44,46,50	0

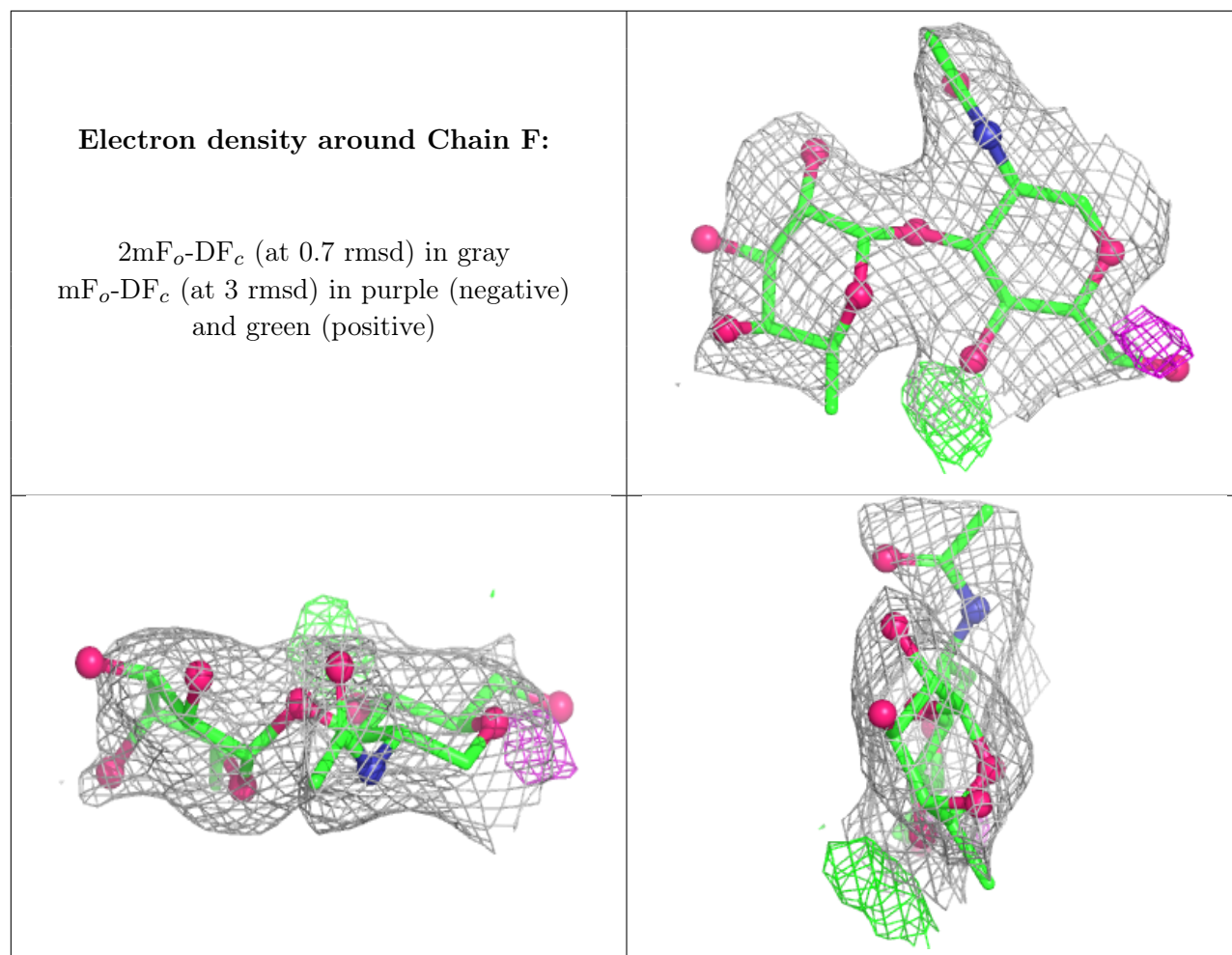
6.3 Carbohydrates [i](#)

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, 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
2	FUC	E	2	10/11	0.40	0.17	54,61,63,67	0
2	NAG	F	1	14/15	0.71	0.14	50,54,57,61	0
2	FUC	F	2	10/11	0.77	0.11	51,53,57,65	0
2	NAG	E	1	14/15	0.81	0.12	51,57,63,63	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](#)

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	C	403	14/15	0.65	0.13	56,62,66,71	0
3	PEG	C	404	7/7	0.84	0.14	30,36,39,49	0
3	PEG	A	401	7/7	0.91	0.10	38,38,44,44	0

6.5 Other polymers [i](#)

There are no such residues in this entry.