



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 6, 2026 – 09:43 PM UTC

PDB ID : 4BSU / pdb_00004bsu
Title : Structure of the ectodomain of LGR5 in complex with R-spondin-1 (Fu1Fu2) in C2 crystal form
Authors : Peng, W.C.; de Lau, W.; Forneris, F.; Granneman, J.C.M.; Huch, M.; Clevers, H.; Gros, P.
Deposited on : 2013-06-11
Resolution : 3.20 Å(reported)

This is a wwPDB X-ray Structure Validation Summary 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

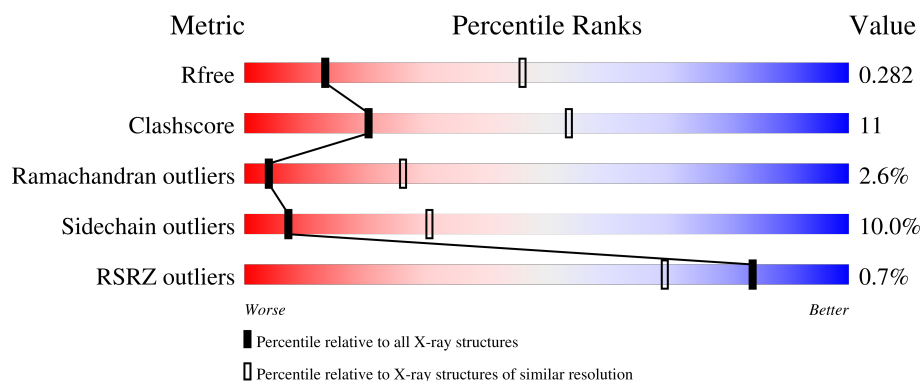
1 Overall quality at a glance ⓘ

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 3.20 Å.

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



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	180053	1466 (3.20-3.20)
Clashscore	190562	1573 (3.20-3.20)
Ramachandran outliers	187476	1548 (3.20-3.20)
Sidechain outliers	187428	1547 (3.20-3.20)
RSRZ outliers	180081	1466 (3.20-3.20)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions $\leq 5\%$. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	539	% 62% 23% • 12%
1	B	539	58% 24% 5% 13%
1	E	539	58% 23% 5% 14%
1	F	539	% 57% 23% 6% 14%
2	C	126	% 59% 15% 7% • 18%

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Mol	Chain	Length	Quality of chain
2	D	126	60%17%5%•17%
2	G	126	52%24%••18%
2	H	126	% 53%21%7%•17%
3	I	2	50%50%
4	J	3	100%
4	K	3	67%33%
4	L	3	33%67%

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 17955 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 LEUCINE-RICH REPEAT-CONTAINING G-PROTEIN COUPLED RECEPTOR 5.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	474	Total	C	N	O	S	118	0	0
			3725	2377	639	692	17			
1	B	471	Total	C	N	O	S	107	0	0
			3698	2359	633	689	17			
1	E	462	Total	C	N	O	S	0	0	0
			3616	2303	622	674	17			
1	F	463	Total	C	N	O	S	0	0	0
			3630	2313	627	673	17			

There are 68 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	8	HIS	-	expression tag	UNP O75473
A	9	HIS	-	expression tag	UNP O75473
A	10	HIS	-	expression tag	UNP O75473
A	11	HIS	-	expression tag	UNP O75473
A	12	HIS	-	expression tag	UNP O75473
A	13	HIS	-	expression tag	UNP O75473
A	14	GLU	-	expression tag	UNP O75473
A	15	ASN	-	expression tag	UNP O75473
A	16	LEU	-	expression tag	UNP O75473
A	17	TYR	-	expression tag	UNP O75473
A	18	PHE	-	expression tag	UNP O75473
A	19	GLN	-	expression tag	UNP O75473
A	20	GLY	-	expression tag	UNP O75473
A	21	SER	-	expression tag	UNP O75473
A	544	ALA	-	expression tag	UNP O75473
A	545	ALA	-	expression tag	UNP O75473
A	546	ALA	-	expression tag	UNP O75473
B	8	HIS	-	expression tag	UNP O75473
B	9	HIS	-	expression tag	UNP O75473
B	10	HIS	-	expression tag	UNP O75473

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Chain	Residue	Modelled	Actual	Comment	Reference
B	11	HIS	-	expression tag	UNP O75473
B	12	HIS	-	expression tag	UNP O75473
B	13	HIS	-	expression tag	UNP O75473
B	14	GLU	-	expression tag	UNP O75473
B	15	ASN	-	expression tag	UNP O75473
B	16	LEU	-	expression tag	UNP O75473
B	17	TYR	-	expression tag	UNP O75473
B	18	PHE	-	expression tag	UNP O75473
B	19	GLN	-	expression tag	UNP O75473
B	20	GLY	-	expression tag	UNP O75473
B	21	SER	-	expression tag	UNP O75473
B	544	ALA	-	expression tag	UNP O75473
B	545	ALA	-	expression tag	UNP O75473
B	546	ALA	-	expression tag	UNP O75473
E	8	HIS	-	expression tag	UNP O75473
E	9	HIS	-	expression tag	UNP O75473
E	10	HIS	-	expression tag	UNP O75473
E	11	HIS	-	expression tag	UNP O75473
E	12	HIS	-	expression tag	UNP O75473
E	13	HIS	-	expression tag	UNP O75473
E	14	GLU	-	expression tag	UNP O75473
E	15	ASN	-	expression tag	UNP O75473
E	16	LEU	-	expression tag	UNP O75473
E	17	TYR	-	expression tag	UNP O75473
E	18	PHE	-	expression tag	UNP O75473
E	19	GLN	-	expression tag	UNP O75473
E	20	GLY	-	expression tag	UNP O75473
E	21	SER	-	expression tag	UNP O75473
E	544	ALA	-	expression tag	UNP O75473
E	545	ALA	-	expression tag	UNP O75473
E	546	ALA	-	expression tag	UNP O75473
F	8	HIS	-	expression tag	UNP O75473
F	9	HIS	-	expression tag	UNP O75473
F	10	HIS	-	expression tag	UNP O75473
F	11	HIS	-	expression tag	UNP O75473
F	12	HIS	-	expression tag	UNP O75473
F	13	HIS	-	expression tag	UNP O75473
F	14	GLU	-	expression tag	UNP O75473
F	15	ASN	-	expression tag	UNP O75473
F	16	LEU	-	expression tag	UNP O75473
F	17	TYR	-	expression tag	UNP O75473
F	18	PHE	-	expression tag	UNP O75473

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Chain	Residue	Modelled	Actual	Comment	Reference
F	19	GLN	-	expression tag	UNP O75473
F	20	GLY	-	expression tag	UNP O75473
F	21	SER	-	expression tag	UNP O75473
F	544	ALA	-	expression tag	UNP O75473
F	545	ALA	-	expression tag	UNP O75473
F	546	ALA	-	expression tag	UNP O75473

- Molecule 2 is a protein called R-SPONDIN-1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	C	103	Total	C	N	O	S	0	0	0
			778	480	137	143	18			
2	D	104	Total	C	N	O	S	0	0	0
			784	483	138	145	18			
2	G	103	Total	C	N	O	S	0	0	0
			772	477	134	143	18			
2	H	104	Total	C	N	O	S	0	0	0
			779	480	137	144	18			

There are 40 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
C	29	GLY	-	expression tag	UNP Q2MKA7
C	30	SER	-	expression tag	UNP Q2MKA7
C	147	ALA	-	expression tag	UNP Q2MKA7
C	148	ALA	-	expression tag	UNP Q2MKA7
C	149	HIS	-	expression tag	UNP Q2MKA7
C	150	HIS	-	expression tag	UNP Q2MKA7
C	151	HIS	-	expression tag	UNP Q2MKA7
C	152	HIS	-	expression tag	UNP Q2MKA7
C	153	HIS	-	expression tag	UNP Q2MKA7
C	154	HIS	-	expression tag	UNP Q2MKA7
D	29	GLY	-	expression tag	UNP Q2MKA7
D	30	SER	-	expression tag	UNP Q2MKA7
D	147	ALA	-	expression tag	UNP Q2MKA7
D	148	ALA	-	expression tag	UNP Q2MKA7
D	149	HIS	-	expression tag	UNP Q2MKA7
D	150	HIS	-	expression tag	UNP Q2MKA7
D	151	HIS	-	expression tag	UNP Q2MKA7
D	152	HIS	-	expression tag	UNP Q2MKA7
D	153	HIS	-	expression tag	UNP Q2MKA7
D	154	HIS	-	expression tag	UNP Q2MKA7

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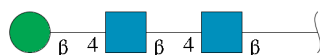
Chain	Residue	Modelled	Actual	Comment	Reference
G	29	GLY	-	expression tag	UNP Q2MKA7
G	30	SER	-	expression tag	UNP Q2MKA7
G	147	ALA	-	expression tag	UNP Q2MKA7
G	148	ALA	-	expression tag	UNP Q2MKA7
G	149	HIS	-	expression tag	UNP Q2MKA7
G	150	HIS	-	expression tag	UNP Q2MKA7
G	151	HIS	-	expression tag	UNP Q2MKA7
G	152	HIS	-	expression tag	UNP Q2MKA7
G	153	HIS	-	expression tag	UNP Q2MKA7
G	154	HIS	-	expression tag	UNP Q2MKA7
H	29	GLY	-	expression tag	UNP Q2MKA7
H	30	SER	-	expression tag	UNP Q2MKA7
H	147	ALA	-	expression tag	UNP Q2MKA7
H	148	ALA	-	expression tag	UNP Q2MKA7
H	149	HIS	-	expression tag	UNP Q2MKA7
H	150	HIS	-	expression tag	UNP Q2MKA7
H	151	HIS	-	expression tag	UNP Q2MKA7
H	152	HIS	-	expression tag	UNP Q2MKA7
H	153	HIS	-	expression tag	UNP Q2MKA7
H	154	HIS	-	expression tag	UNP Q2MKA7

- Molecule 3 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
3	I	2	Total	C	N	O	0	0	0
			28	16	2	10			

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



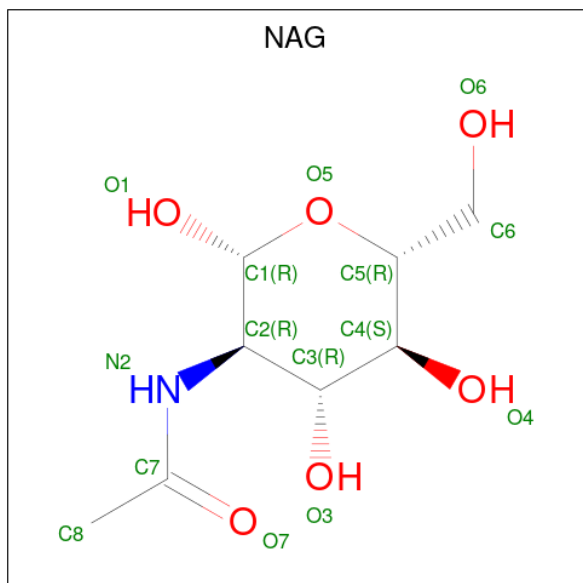
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
4	J	3	Total	C	N	O	0	0	0
			39	22	2	15			

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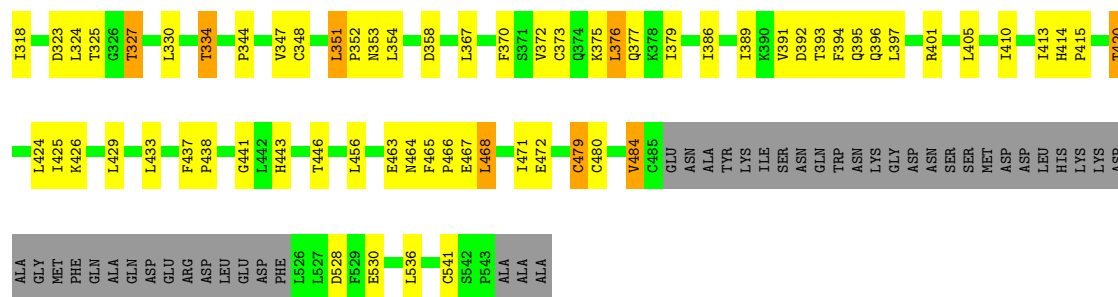
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Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
4	K	3	Total	C	N	O	0	0	0
			39	22	2	15			
4	L	3	Total	C	N	O	0	0	0
			39	22	2	15			

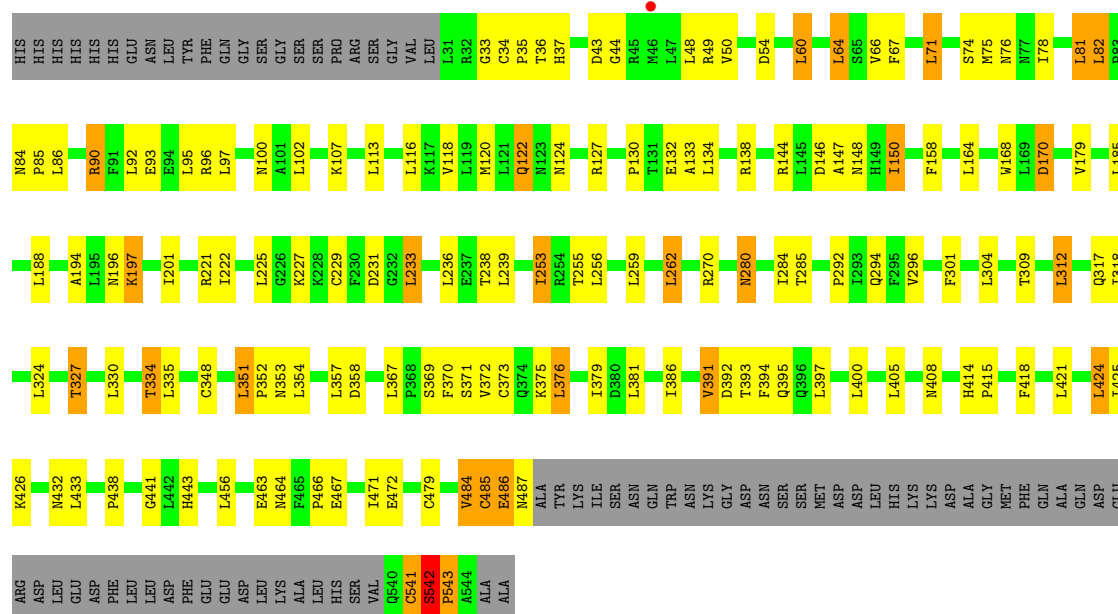
- Molecule 5 is 2-acetamido-2-deoxy-beta-D-glucopyranose (CCD ID: NAG) (formula: $C_8H_{15}NO_6$).



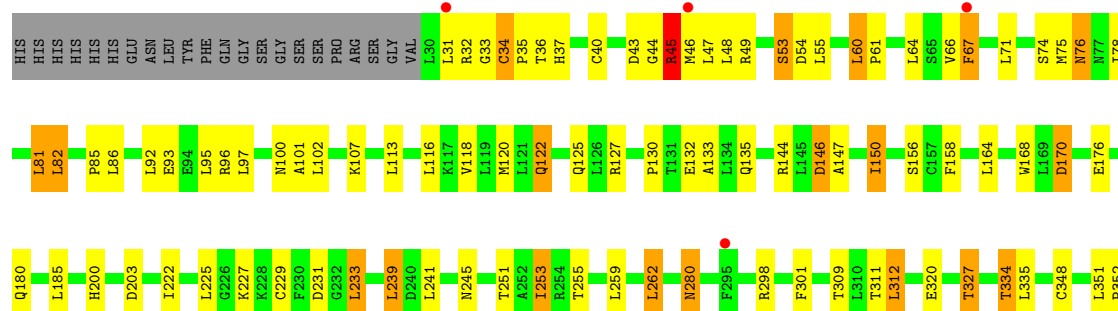
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
5	B	1	Total	C	N	O	0	0
			14	8	1	5		
5	F	1	Total	C	N	O	0	0
			14	8	1	5		

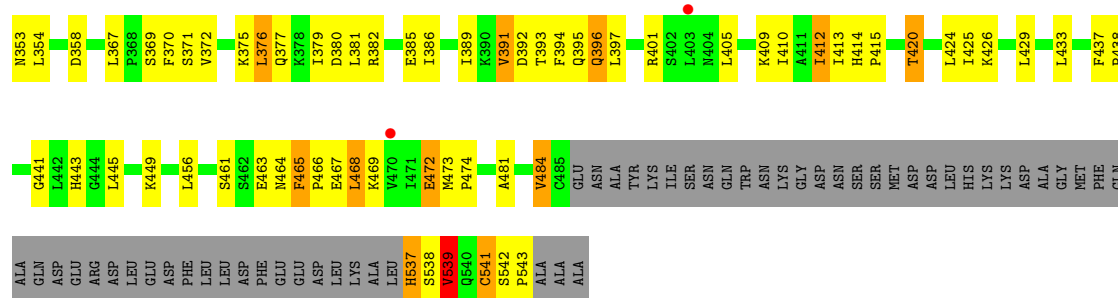


• Molecule 1: LEUCINE-RICH REPEAT-CONTAINING G-PROTEIN COUPLED RECEPTOR
5

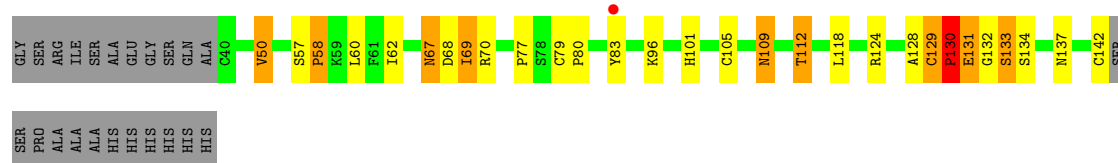


• Molecule 1: LEUCINE-RICH REPEAT-CONTAINING G-PROTEIN COUPLED RECEPTOR
5

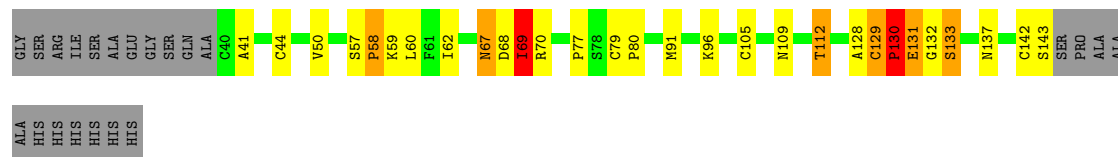




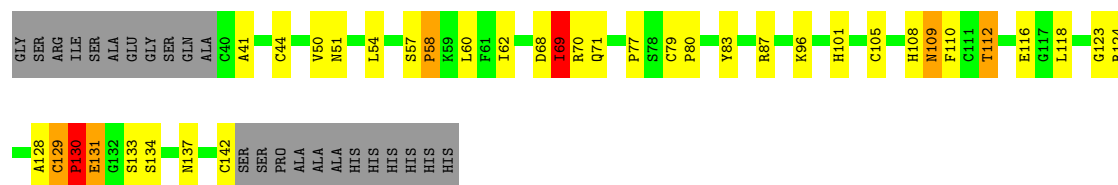
• Molecule 2: R-SPONDIN-1



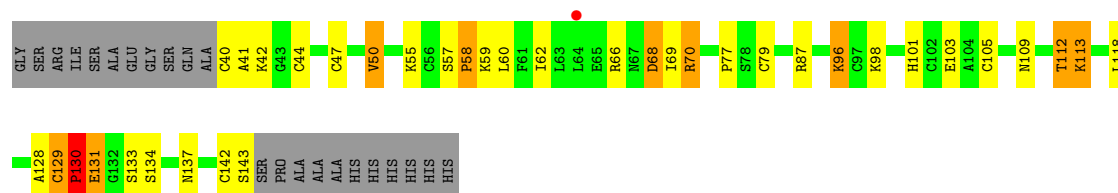
• Molecule 2: R-SPONDIN-1



• Molecule 2: R-SPONDIN-1



• Molecule 2: R-SPONDIN-1

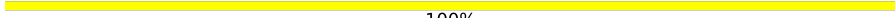


- Molecule 3: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain I:  50% 50%

MAG1
MAG2

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

Chain J:  100%

MAG1
MAG2
BMA3

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

Chain K:  67% 33%

MAG1
MAG2
BMA3

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

Chain L:  33% 67%

MAG1
MAG2
BMA3

4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	495.13Å 62.15Å 104.87Å 90.00° 91.19° 90.00°	Depositor
Resolution (Å)	65.50 – 3.20 65.50 – 3.20	Depositor EDS
% Data completeness (in resolution range)	98.6 (65.50-3.20) 93.6 (65.50-3.20)	Depositor EDS
R_{merge}	0.08	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.37 (at 3.19Å)	Xtriage
Refinement program	PHENIX (PHENIX.REFINE: 1.8.2_1309)	Depositor
R, R_{free}	0.240 , 0.287 0.234 , 0.282	Depositor DCC
R_{free} test set	2697 reflections (5.10%)	wwPDB-VP
Wilson B-factor (Å ²)	94.8	Xtriage
Anisotropy	0.938	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 104.7	EDS
L-test for twinning ²	$\langle L \rangle = 0.45$, $\langle L^2 \rangle = 0.28$	Xtriage
Estimated twinning fraction	0.039 for -h,-k,l	Xtriage
F_o, F_c correlation	0.93	EDS
Total number of atoms	17955	wwPDB-VP
Average B, all atoms (Å ²)	131.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.18% 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: BMA, NAG

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	0.33	0/3808	0.85	8/5183 (0.2%)
1	B	0.32	0/3780	0.85	5/5146 (0.1%)
1	E	0.33	1/3696 (0.0%)	1.03	11/5033 (0.2%)
1	F	0.32	0/3710	0.83	8/5049 (0.2%)
2	C	0.39	0/794	0.97	4/1066 (0.4%)
2	D	0.37	0/800	0.97	4/1074 (0.4%)
2	G	0.39	0/788	0.97	4/1059 (0.4%)
2	H	0.38	0/795	1.02	7/1067 (0.7%)
All	All	0.33	1/18171 (0.0%)	0.91	51/24677 (0.2%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	E	0	1

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	E	541	CYS	CA-C	5.22	1.57	1.53

The worst 5 of 51 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	E	543	PRO	CA-C-O	-39.67	48.41	120.60
1	E	543	PRO	O-C-N	-15.12	102.23	122.64
1	E	44	GLY	N-CA-C	-9.20	98.36	112.89
1	A	44	GLY	N-CA-C	-8.26	99.84	112.89

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	D	129	CYS	CA-C-N	8.02	129.86	119.84

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	E	543	PRO	Mainchain

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	3725	0	3727	77	0
1	B	3698	0	3704	88	0
1	E	3616	0	3613	91	0
1	F	3630	0	3635	88	0
2	C	778	0	744	16	0
2	D	784	0	749	14	0
2	G	772	0	733	21	0
2	H	779	0	738	21	0
3	I	28	0	25	0	0
4	J	39	0	34	0	0
4	K	39	0	34	0	0
4	L	39	0	34	1	0
5	B	14	0	13	0	0
5	F	14	0	13	0	0
All	All	17955	0	17796	397	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 11.

The worst 5 of 397 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:203:ASP:OD2	1:E:270:ARG:NH2	2.12	0.83

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:231:ASP:HA	1:A:255:THR:HG21	1.60	0.83
1:F:484:VAL:HG21	1:F:541:CYS:HB3	1.61	0.81
2:C:50:VAL:HG23	2:C:70:ARG:HE	1.48	0.79
1:F:231:ASP:HA	1:F:255:THR:HG21	1.65	0.78

There are no symmetry-related clashes.

5.3 Torsion angles

5.3.1 Protein backbone

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	470/539 (87%)	424 (90%)	44 (9%)	2 (0%)	30	62
1	B	467/539 (87%)	406 (87%)	52 (11%)	9 (2%)	6	33
1	E	458/539 (85%)	415 (91%)	39 (8%)	4 (1%)	14	47
1	F	459/539 (85%)	407 (89%)	43 (9%)	9 (2%)	6	31
2	C	101/126 (80%)	86 (85%)	7 (7%)	8 (8%)	1	5
2	D	102/126 (81%)	86 (84%)	7 (7%)	9 (9%)	0	3
2	G	101/126 (80%)	85 (84%)	8 (8%)	8 (8%)	1	5
2	H	102/126 (81%)	84 (82%)	9 (9%)	9 (9%)	0	3
All	All	2260/2660 (85%)	1993 (88%)	209 (9%)	58 (3%)	4	26

5 of 58 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	35	PRO
1	B	36	THR
2	C	69	ILE
2	C	128	ALA
2	C	129	CYS

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	429/484 (89%)	388 (90%)	41 (10%)	8	32
1	B	427/484 (88%)	382 (90%)	45 (10%)	6	28
1	E	416/484 (86%)	374 (90%)	42 (10%)	7	30
1	F	418/484 (86%)	369 (88%)	49 (12%)	5	23
2	C	89/105 (85%)	83 (93%)	6 (7%)	15	47
2	D	90/105 (86%)	83 (92%)	7 (8%)	11	41
2	G	88/105 (84%)	81 (92%)	7 (8%)	11	40
2	H	88/105 (84%)	81 (92%)	7 (8%)	11	40
All	All	2045/2356 (87%)	1841 (90%)	204 (10%)	7	30

5 of 204 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	E	122	GLN
1	F	60	LEU
2	H	62	ILE
1	E	179	VAL
1	E	327	THR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 30 such sidechains are listed below:

Mol	Chain	Res	Type
1	E	76	ASN
1	F	457	GLN
1	E	219	ASN
2	H	108	HIS
1	F	355	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates ⓘ

11 monosaccharides are modelled in this entry.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# $ Z > 2$	Counts	RMSZ	# $ Z > 2$
3	NAG	I	1	1,3	14,14,15	0.29	0	17,19,21	0.86	2 (11%)
3	NAG	I	2	3	14,14,15	0.44	0	17,19,21	0.60	0
4	NAG	J	1	1,4	14,14,15	1.13	2 (14%)	17,19,21	0.77	0
4	NAG	J	2	4	14,14,15	1.00	1 (7%)	17,19,21	0.86	0
4	BMA	J	3	4	11,11,12	0.66	0	15,15,17	1.23	1 (6%)
4	NAG	K	1	1,4	14,14,15	0.70	1 (7%)	17,19,21	0.49	0
4	NAG	K	2	4	14,14,15	0.28	0	17,19,21	0.57	0
4	BMA	K	3	4	11,11,12	0.94	0	15,15,17	0.84	0
4	NAG	L	1	1,4	14,14,15	0.56	0	17,19,21	1.16	1 (5%)
4	NAG	L	2	4	14,14,15	0.78	1 (7%)	17,19,21	0.90	1 (5%)
4	BMA	L	3	4	11,11,12	0.94	1 (9%)	15,15,17	1.37	1 (6%)

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

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

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
4	NAG	K	2	4	-	2/6/23/26	0/1/1/1
4	BMA	K	3	4	-	2/2/19/22	0/1/1/1
4	NAG	L	1	1,4	-	2/6/23/26	0/1/1/1
4	NAG	L	2	4	-	2/6/23/26	0/1/1/1
4	BMA	L	3	4	-	0/2/19/22	0/1/1/1

The worst 5 of 6 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	J	2	NAG	O5-C1	-3.62	1.37	1.43
4	J	1	NAG	O5-C1	3.26	1.49	1.43
4	J	1	NAG	C1-C2	2.58	1.55	1.52
4	L	2	NAG	C1-C2	2.52	1.55	1.52
4	K	1	NAG	C1-C2	2.36	1.55	1.52

The worst 5 of 6 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	L	3	BMA	C1-O5-C5	4.68	118.46	112.19
4	L	1	NAG	C1-O5-C5	4.03	117.58	112.19
4	J	3	BMA	C1-O5-C5	3.49	116.87	112.19
4	L	2	NAG	C1-O5-C5	2.44	115.45	112.19
3	I	1	NAG	C1-O5-C5	2.08	114.98	112.19

There are no chirality outliers.

5 of 14 torsion outliers are listed below:

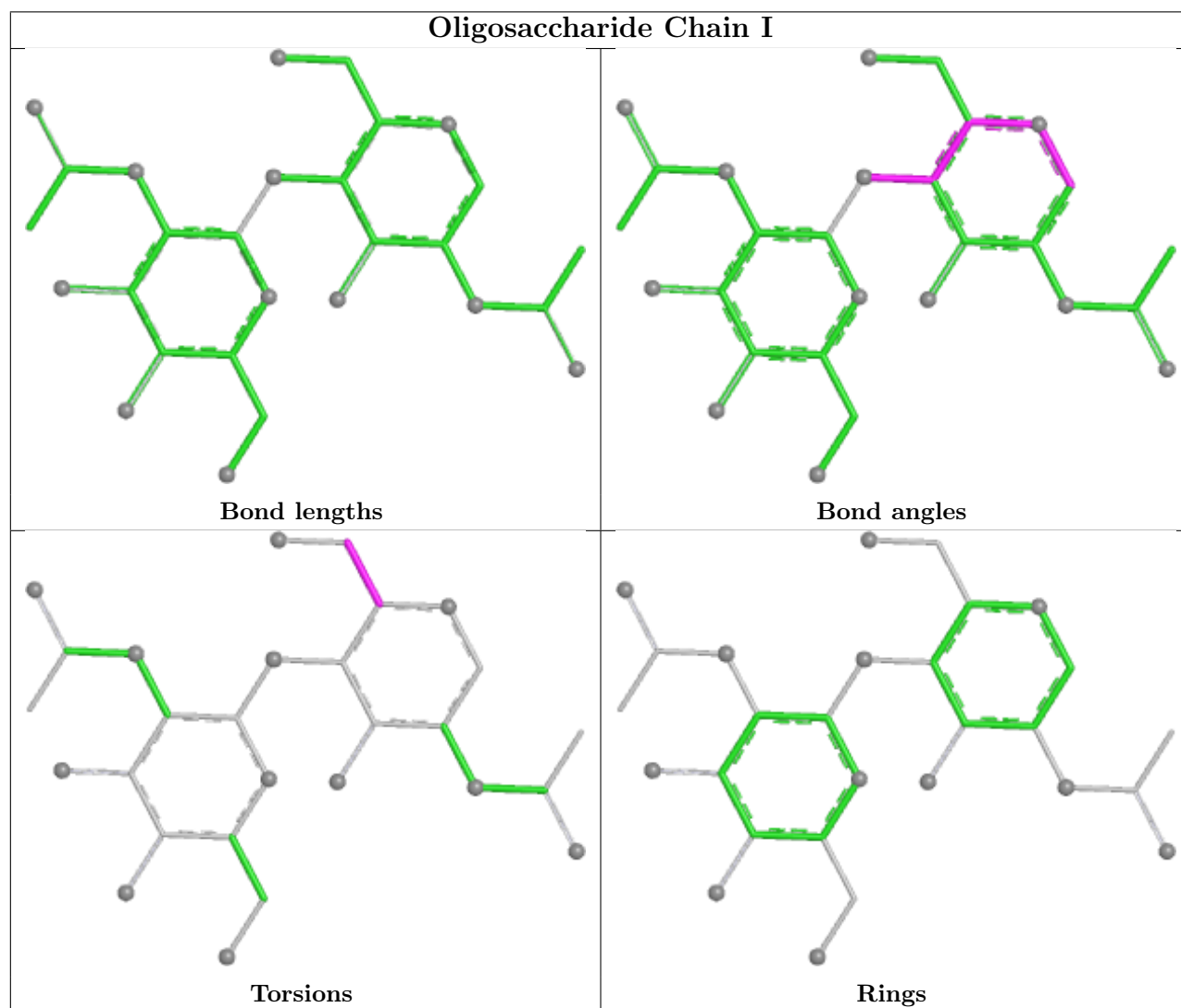
Mol	Chain	Res	Type	Atoms
4	K	3	BMA	O5-C5-C6-O6
4	J	2	NAG	O5-C5-C6-O6
4	K	3	BMA	C4-C5-C6-O6
4	J	2	NAG	C4-C5-C6-O6
4	K	2	NAG	O5-C5-C6-O6

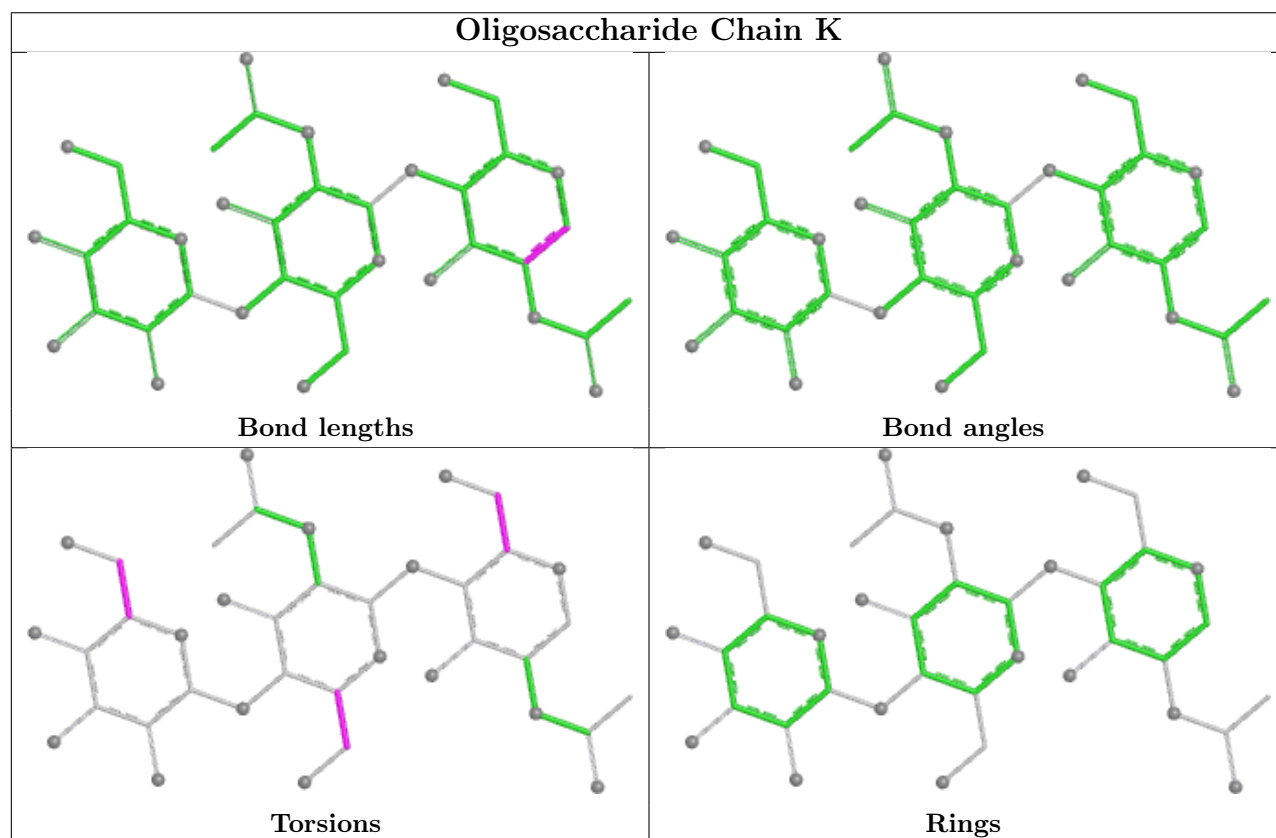
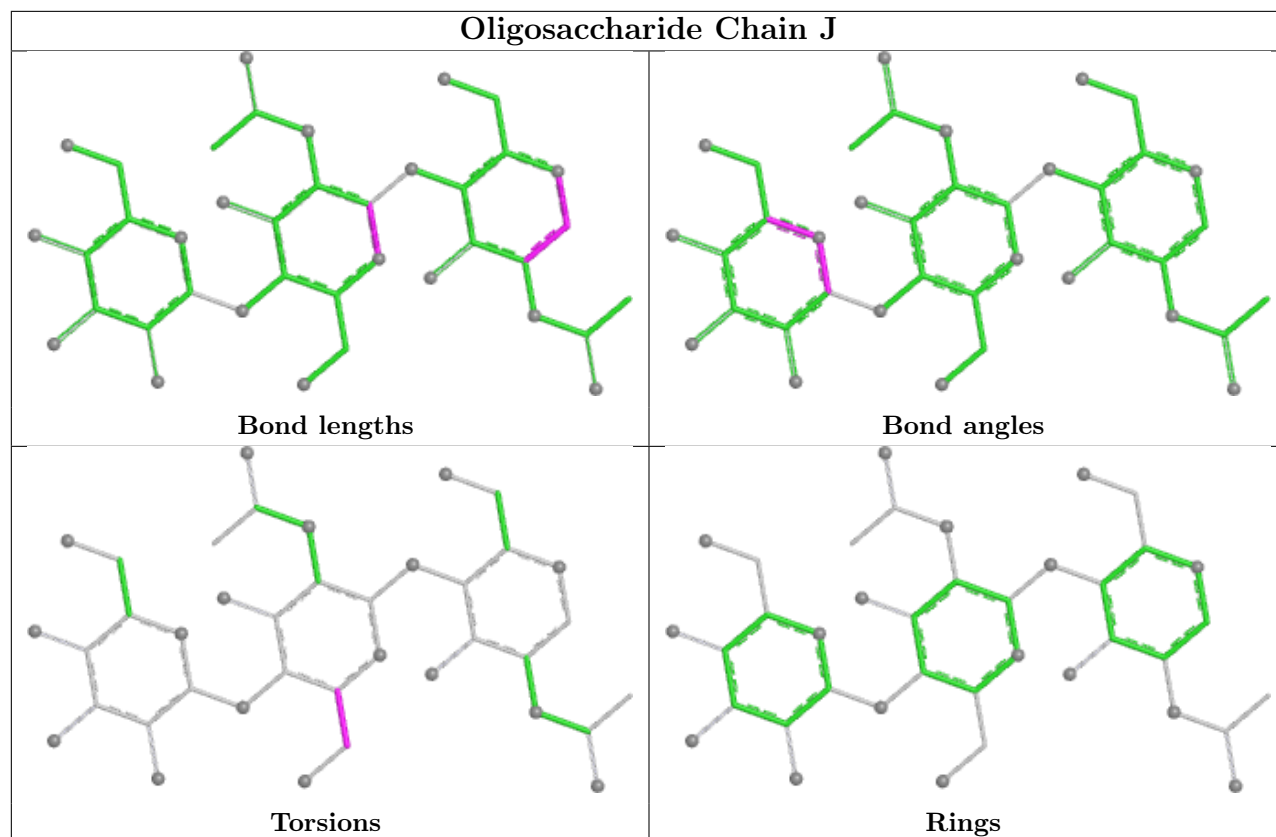
There are no ring outliers.

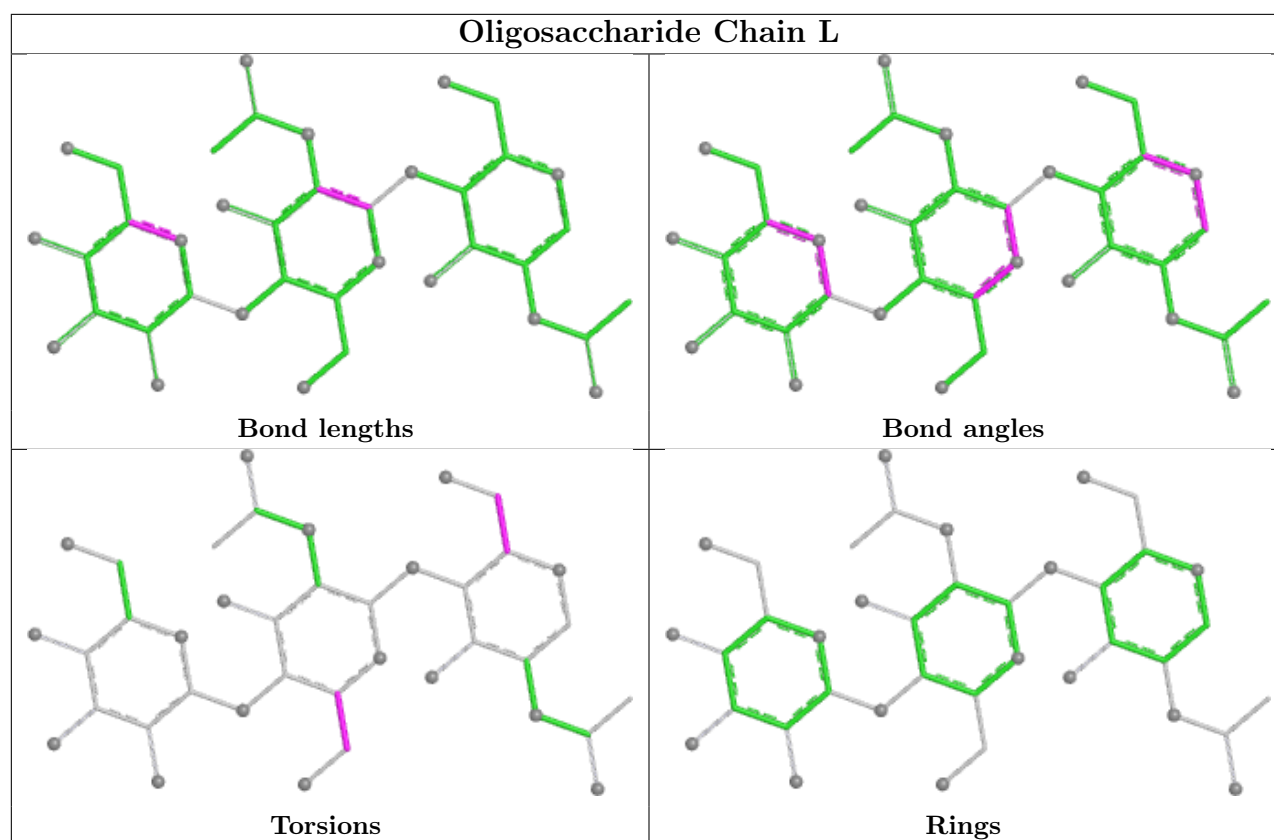
2 monomers are involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	L	1	NAG	1	0
4	L	2	NAG	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 oligosaccharide.







5.6 Ligand geometry [i](#)

2 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	$\# Z > 2$
5	NAG	B	1077	1	14,14,15	0.32	0	17,19,21	0.42	0
5	NAG	F	1077	1	14,14,15	0.26	0	17,19,21	0.43	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	B	1077	1	-	0/6/23/26	0/1/1/1
5	NAG	F	1077	1	-	0/6/23/26	0/1/1/1

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 [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data [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	460/539 (85%)	-0.26	7 (1%) 72 52	75, 111, 163, 220	0
1	B	458/539 (84%)	-0.30	0 100 100	81, 140, 212, 247	0
1	E	462/539 (85%)	-0.26	1 (0%) 91 85	65, 118, 173, 212	0
1	F	463/539 (85%)	-0.26	6 (1%) 75 55	67, 109, 158, 252	0
2	C	103/126 (81%)	-0.08	1 (0%) 79 63	99, 146, 212, 291	0
2	D	104/126 (82%)	-0.32	0 100 100	110, 180, 237, 288	0
2	G	103/126 (81%)	-0.24	0 100 100	91, 165, 231, 258	0
2	H	104/126 (82%)	-0.33	1 (0%) 79 63	74, 135, 217, 247	0
All	All	2257/2660 (84%)	-0.26	16 (0%) 84 69	65, 123, 204, 291	0

The worst 5 of 16 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	F	46	MET	4.3
1	A	357	LEU	2.7
1	A	97	LEU	2.6
1	F	403	LEU	2.5
1	A	81	LEU	2.5

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

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

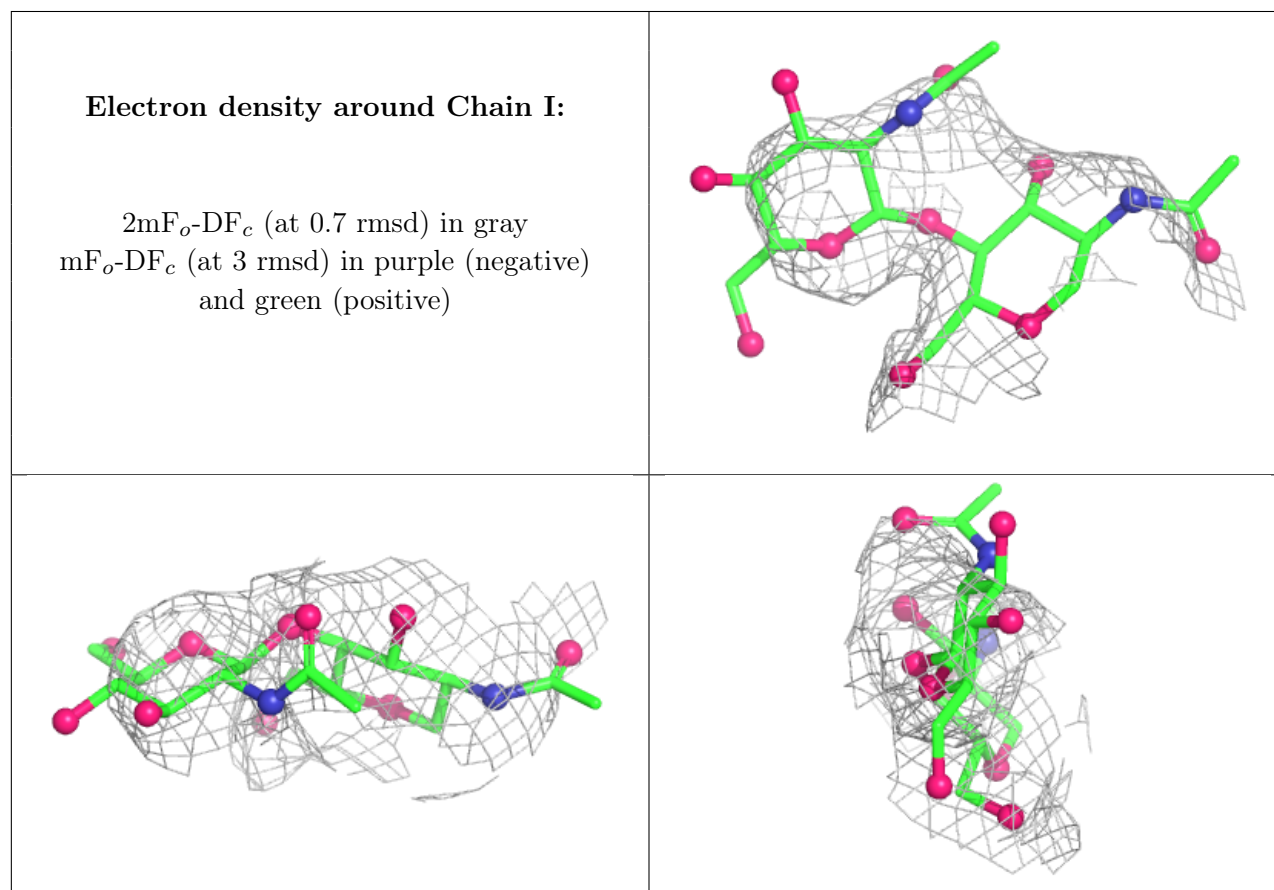
6.3 Carbohydrates [i](#)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum,

median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

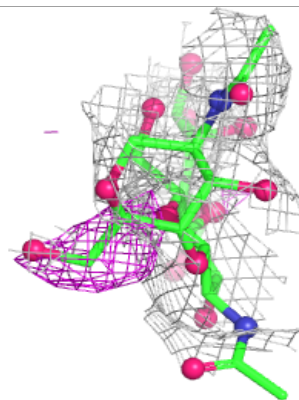
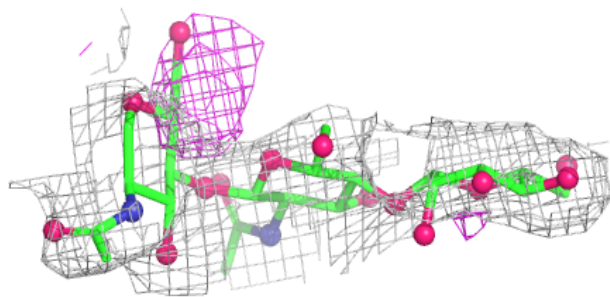
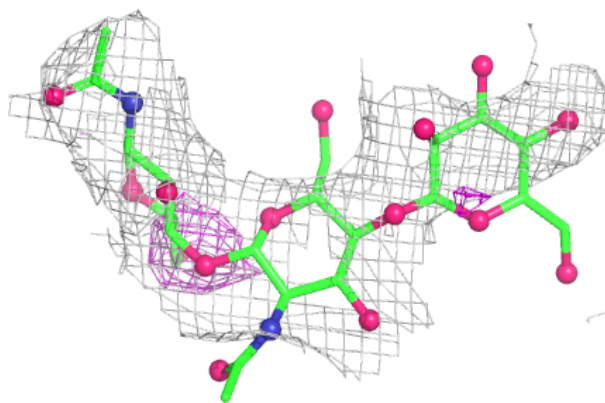
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
4	NAG	J	2	14/15	0.18	0.11	196,208,220,222	0
4	BMA	L	3	11/12	0.30	0.10	169,183,198,200	0
4	NAG	J	1	14/15	0.39	0.12	124,157,182,183	0
4	BMA	K	3	11/12	0.48	0.10	146,179,203,205	0
4	BMA	J	3	11/12	0.50	0.08	216,222,226,228	0
4	NAG	L	2	14/15	0.52	0.09	182,194,202,205	0
3	NAG	I	2	14/15	0.55	0.07	209,218,221,223	0
3	NAG	I	1	14/15	0.69	0.07	183,197,210,211	0
4	NAG	L	1	14/15	0.69	0.08	113,137,179,189	0
4	NAG	K	2	14/15	0.81	0.07	134,155,165,172	0
4	NAG	K	1	14/15	0.85	0.09	106,149,169,170	0

The following is a graphical depiction of the model fit to experimental electron density for oligosaccharide. Each fit is shown from different orientation to approximate a three-dimensional view.

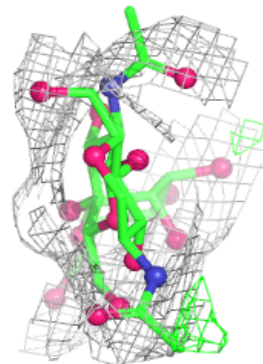
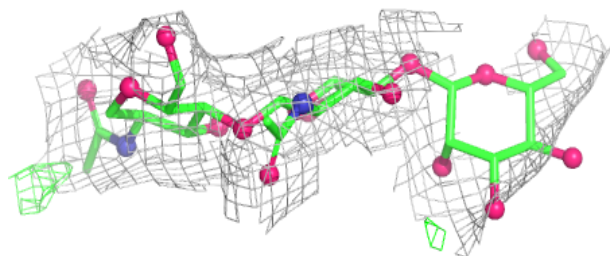
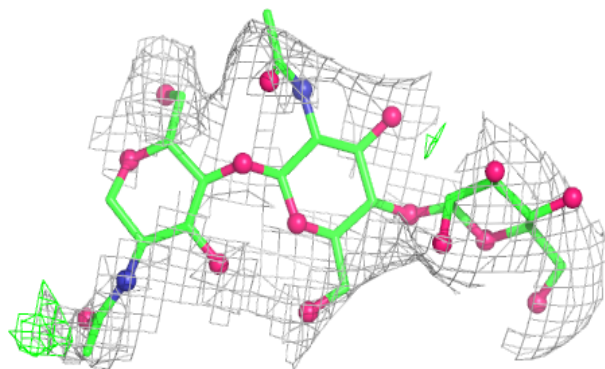


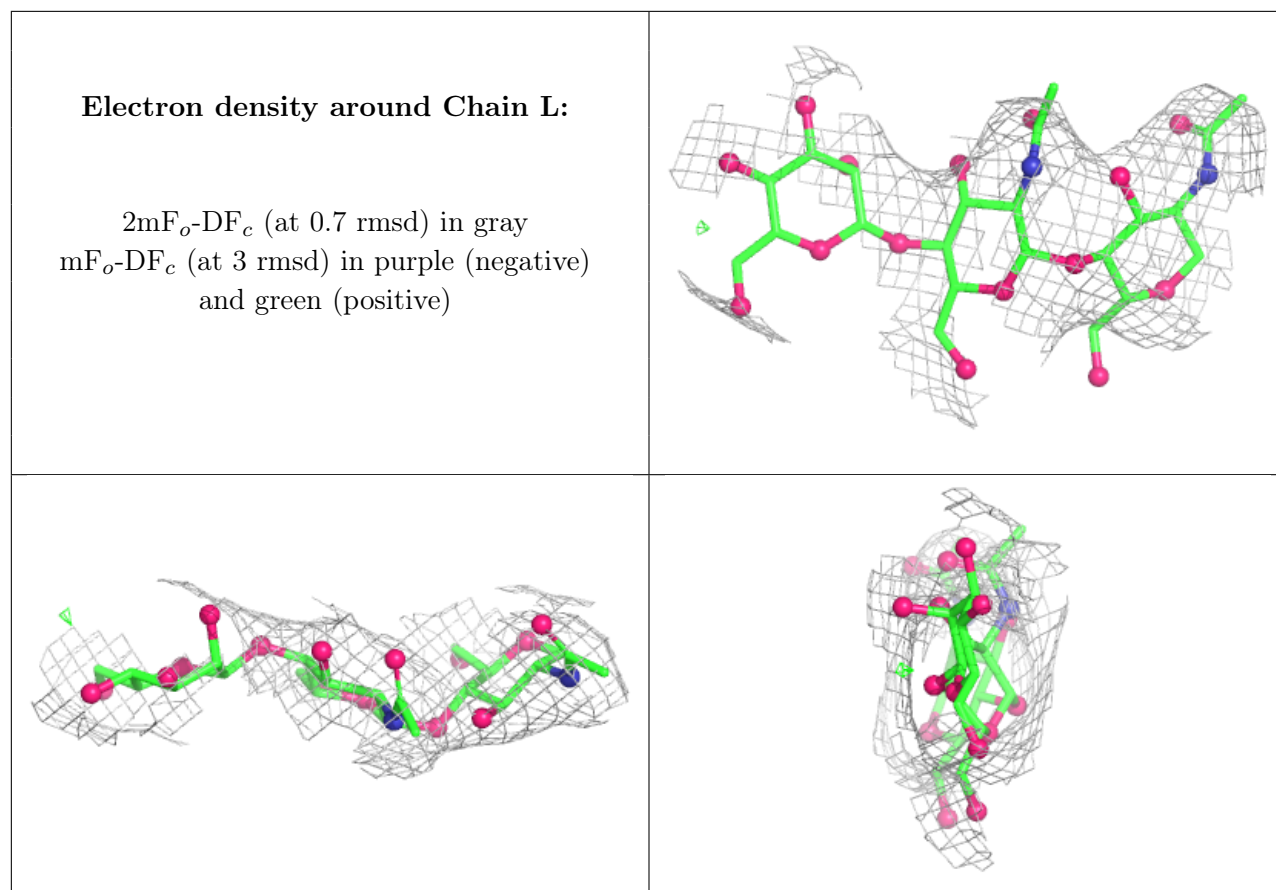
Electron density around Chain J:

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

**Electron density around Chain 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
5	NAG	B	1077	14/15	0.45	0.09	144,180,196,201	0
5	NAG	F	1077	14/15	0.58	0.07	169,175,193,196	0

6.5 Other polymers [i](#)

There are no such residues in this entry.