



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 9, 2026 – 03:57 AM UTC

PDB ID : 3M5G / pdb_00003m5g
Title : Crystal structure of a H7 influenza virus hemagglutinin
Authors : Yang, H.; Chen, L.M.; Carney, P.J.; Donis, R.O.; Stevens, J.
Deposited on : 2010-03-12
Resolution : 2.60 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

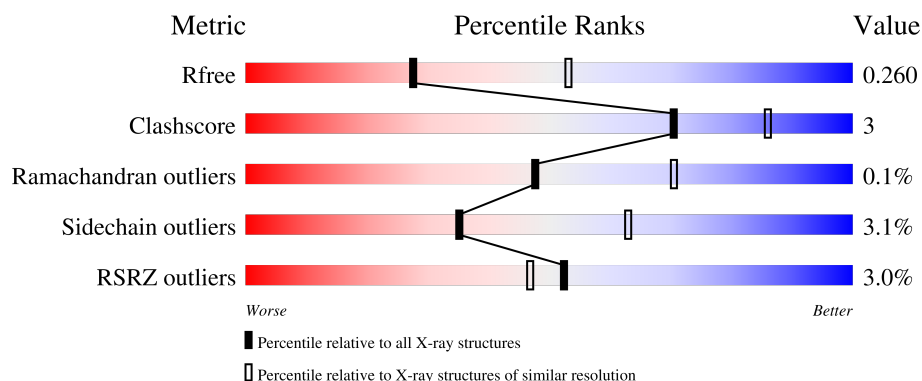
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.60 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	4008 (2.60-2.60)
Clashscore	190562	4347 (2.60-2.60)
Ramachandran outliers	187476	4277 (2.60-2.60)
Sidechain outliers	187428	4277 (2.60-2.60)
RSRZ outliers	180081	4008 (2.60-2.60)

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	317	3% 85% 12% ..
1	C	317	2% 85% 11% ..
1	E	317	3% 87% 9% ..
2	B	182	2% 87% 7% ..
2	D	182	4% 84% 12% 5%

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Mol	Chain	Length	Quality of chain
2	F	182	
3	G	2	
3	H	2	
3	I	2	

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	NAG	E	1	X	-	-	-

2 Entry composition

There are 6 unique types of molecules in this entry. The entry contains 11791 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 Hemagglutinin.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	310	Total	C	N	O	S	0	0	0
			2392	1488	433	458	13			
1	C	308	Total	C	N	O	S	0	0	0
			2379	1480	430	456	13			
1	E	309	Total	C	N	O	S	0	0	0
			2383	1482	431	457	13			

There are 18 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	7	ALA	-	expression tag	UNP B7NY59
A	8	ASP	-	expression tag	UNP B7NY59
A	9	PRO	-	expression tag	UNP B7NY59
A	216	ASN	SER	SEE REMARK 999	UNP B7NY59
A	257	THR	ALA	SEE REMARK 999	UNP B7NY59
A	309	VAL	ILE	SEE REMARK 999	UNP B7NY59
C	7	ALA	-	expression tag	UNP B7NY59
C	8	ASP	-	expression tag	UNP B7NY59
C	9	PRO	-	expression tag	UNP B7NY59
C	216	ASN	SER	SEE REMARK 999	UNP B7NY59
C	257	THR	ALA	SEE REMARK 999	UNP B7NY59
C	309	VAL	ILE	SEE REMARK 999	UNP B7NY59
E	7	ALA	-	expression tag	UNP B7NY59
E	8	ASP	-	expression tag	UNP B7NY59
E	9	PRO	-	expression tag	UNP B7NY59
E	216	ASN	SER	SEE REMARK 999	UNP B7NY59
E	257	THR	ALA	SEE REMARK 999	UNP B7NY59
E	309	VAL	ILE	SEE REMARK 999	UNP B7NY59

- Molecule 2 is a protein called Hemagglutinin.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	174	Total	C	N	O	S	0	0	0
			1409	871	246	285	7			
2	D	173	Total	C	N	O	S	0	0	0
			1401	867	245	282	7			
2	F	172	Total	C	N	O	S	0	0	0
			1393	861	244	281	7			

There are 18 discrepancies between the modelled and reference sequences:

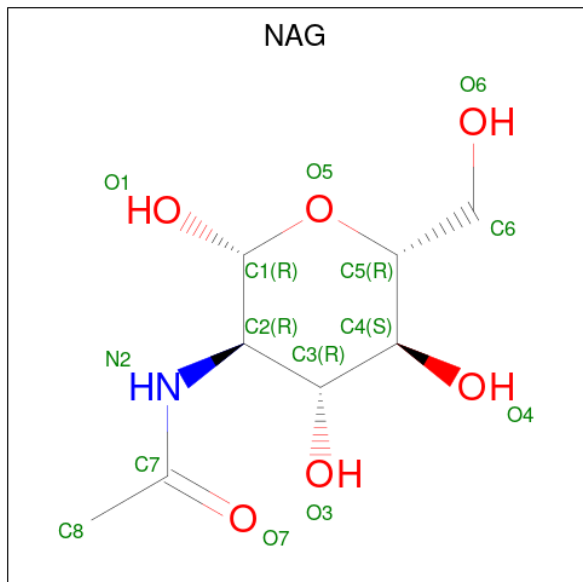
Chain	Residue	Modelled	Actual	Comment	Reference
B	176	GLY	VAL	SEE REMARK 999	UNP B7NYS1
B	177	ARG	LYS	SEE REMARK 999	UNP B7NYS1
B	179	VAL	-	expression tag	UNP B7NYS1
B	180	PRO	-	expression tag	UNP B7NYS1
B	181	ARG	-	expression tag	UNP B7NYS1
B	182	GLY	-	expression tag	UNP B7NYS1
D	176	GLY	VAL	SEE REMARK 999	UNP B7NYS1
D	177	ARG	LYS	SEE REMARK 999	UNP B7NYS1
D	179	VAL	-	expression tag	UNP B7NYS1
D	180	PRO	-	expression tag	UNP B7NYS1
D	181	ARG	-	expression tag	UNP B7NYS1
D	182	GLY	-	expression tag	UNP B7NYS1
F	176	GLY	VAL	SEE REMARK 999	UNP B7NYS1
F	177	ARG	LYS	SEE REMARK 999	UNP B7NYS1
F	179	VAL	-	expression tag	UNP B7NYS1
F	180	PRO	-	expression tag	UNP B7NYS1
F	181	ARG	-	expression tag	UNP B7NYS1
F	182	GLY	-	expression tag	UNP B7NYS1

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



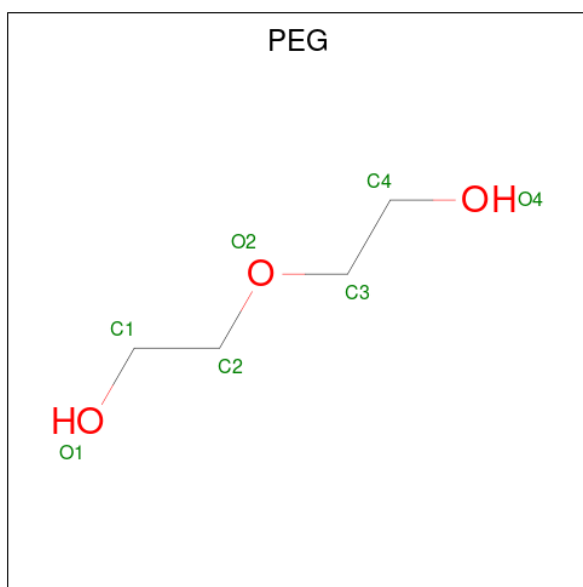
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
3	G	2	Total	C	N	O	0	0	0
			28	16	2	10			
3	H	2	Total	C	N	O	0	0	0
			28	16	2	10			
3	I	2	Total	C	N	O	0	0	0
			28	16	2	10			

- 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	A	1	Total	C	N	O	0	0
			14	8	1	5		
4	D	1	Total	C	N	O	0	0
			14	8	1	5		
4	E	1	Total	C	N	O	0	0
			14	8	1	5		

- Molecule 5 is DI(HYDROXYETHYL)ETHER (CCD ID: PEG) (formula: $C_4H_{10}O_3$).



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

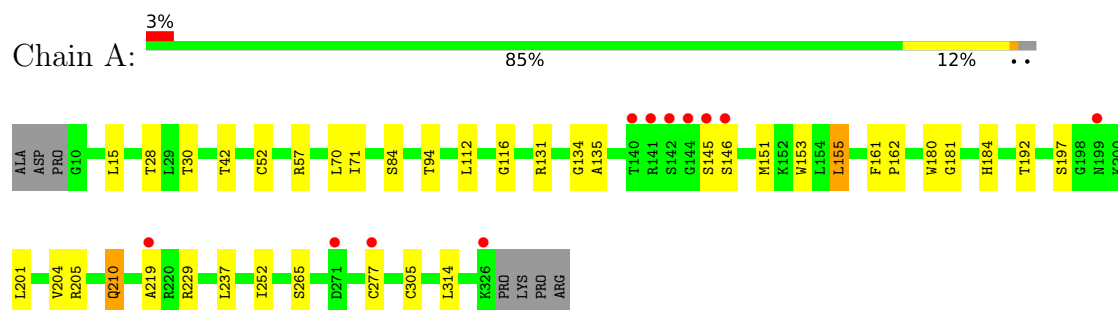
- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	66	Total	O	0	0
			66	66		
6	B	33	Total	O	0	0
			33	33		
6	C	41	Total	O	0	0
			41	41		
6	D	34	Total	O	0	0
			34	34		
6	E	72	Total	O	0	0
			72	72		
6	F	48	Total	O	0	0
			48	48		

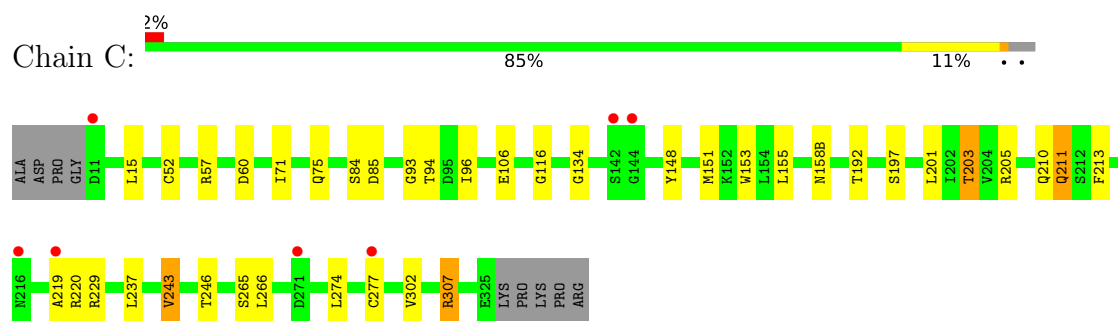
3 Residue-property plots [i](#)

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.

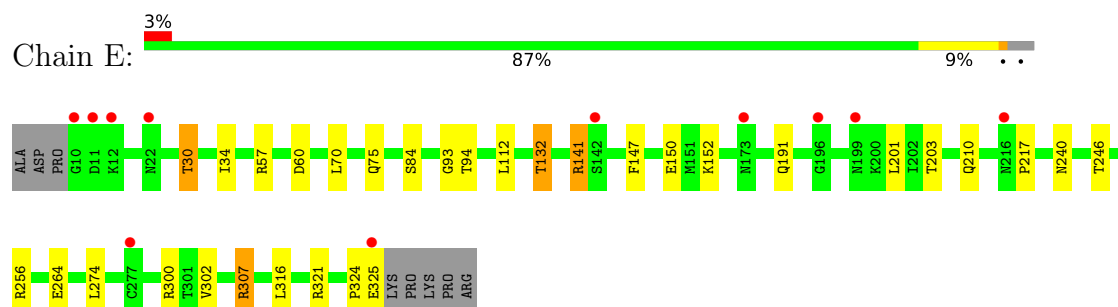
• Molecule 1: Hemagglutinin



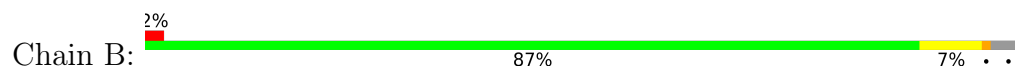
• Molecule 1: Hemagglutinin



• Molecule 1: Hemagglutinin

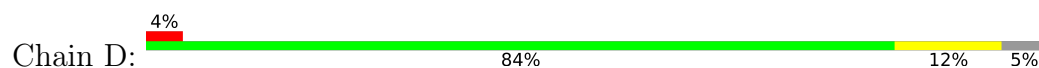


• Molecule 2: Hemagglutinin

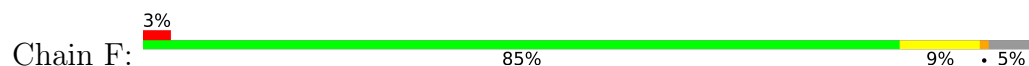




- Molecule 2: Hemagglutinin



- Molecule 2: Hemagglutinin



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



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



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



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	66.88Å 115.43Å 250.97Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	50.00 – 2.60 50.00 – 2.60	Depositor EDS
% Data completeness (in resolution range)	99.3 (50.00-2.60) 99.3 (50.00-2.60)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.11	Depositor
$\langle I/\sigma(I) \rangle$ ¹	4.73 (at 2.61Å)	Xtriage
Refinement program	REFMAC 5.5.0044	Depositor
R, R_{free}	0.217 , 0.256 0.221 , 0.260	Depositor DCC
R_{free} test set	3053 reflections (5.02%)	wwPDB-VP
Wilson B-factor (Å ²)	30.0	Xtriage
Anisotropy	0.139	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 15.2	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.90	EDS
Total number of atoms	11791	wwPDB-VP
Average B, all atoms (Å ²)	16.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.11% 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: NAG, PEG

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	0.44	1/2440 (0.0%)	0.68	0/3297
1	C	0.44	1/2427 (0.0%)	0.72	3/3281 (0.1%)
1	E	0.58	2/2431 (0.1%)	0.76	3/3286 (0.1%)
2	B	0.39	0/1433	0.77	0/1932
2	D	0.42	1/1425 (0.1%)	0.78	0/1921
2	F	0.47	1/1417 (0.1%)	0.81	0/1910
All	All	0.47	6/11573 (0.1%)	0.74	6/15627 (0.0%)

All (6) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	E	93	GLY	C-N	-14.27	1.14	1.33
1	C	94	THR	C-N	-8.31	1.21	1.33
1	E	94	THR	C-N	5.40	1.41	1.33
1	A	210	GLN	CD-OE1	5.23	1.33	1.23
2	F	27	GLN	CD-OE1	5.18	1.33	1.23
2	D	79	ASN	CG-OD1	5.12	1.33	1.23

All (6) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	E	93	GLY	CA-C-N	11.82	142.19	122.33
1	E	93	GLY	C-N-CA	11.82	142.19	122.33
1	E	93	GLY	O-C-N	-8.46	114.55	122.93
1	C	93	GLY	O-C-N	-7.69	114.92	122.84
1	C	93	GLY	CA-C-N	6.52	133.29	122.73
1	C	93	GLY	C-N-CA	6.52	133.29	122.73

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	2392	0	2353	24	0
1	C	2379	0	2337	22	0
1	E	2383	0	2339	17	0
2	B	1409	0	1316	9	0
2	D	1401	0	1312	15	0
2	F	1393	0	1301	12	0
3	G	28	0	25	1	0
3	H	28	0	25	0	0
3	I	28	0	25	0	0
4	A	14	0	13	0	0
4	D	14	0	13	0	0
4	E	14	0	13	0	0
5	B	14	0	20	0	0
6	A	66	0	0	0	0
6	B	33	0	0	0	0
6	C	41	0	0	0	0
6	D	34	0	0	0	0
6	E	72	0	0	0	0
6	F	48	0	0	0	0
All	All	11791	0	11092	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 3.

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)
2:D:88:MET:HE1	2:F:91:ILE:CD1	1.86	1.05
2:D:88:MET:CE	2:F:91:ILE:HD11	1.88	1.03
2:D:88:MET:HE1	2:F:91:ILE:HD11	1.09	1.03
1:E:57:ARG:O	1:E:84:SER:HB2	1.91	0.71
1:A:71:ILE:HG22	1:A:151:MET:HE3	1.78	0.65
1:C:203:THR:HG23	1:C:246:THR:OG1	1.99	0.63
1:C:205:ARG:HG2	1:C:210:GLN:HG3	1.79	0.63
2:B:124:LYS:HD3	2:D:134:GLY:HA2	1.81	0.61

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:211:GLN:HG2	1:C:213:PHE:CZ	2.36	0.59
1:E:300:ARG:NH1	2:F:67:ASP:OD2	2.32	0.59
1:C:57:ARG:O	1:C:84:SER:HB2	2.04	0.58
1:A:192:THR:HG22	1:A:197:SER:HA	1.86	0.58
1:C:15:LEU:HD13	2:D:119:TYR:HA	1.88	0.55
1:E:141:ARG:NH2	1:E:147:PHE:O	2.39	0.55
2:B:77:ILE:HD11	2:D:80:VAL:HG21	1.88	0.55
1:C:302:VAL:HG11	2:D:65:LEU:HG	1.88	0.55
1:E:34:ILE:HD11	1:E:321:ARG:HE	1.73	0.53
1:C:307:ARG:NH2	2:D:60:ASN:OD1	2.40	0.53
1:E:70:LEU:HD11	1:E:112:LEU:HD11	1.91	0.53
1:E:150:GLU:OE1	1:E:256:ARG:HD3	2.09	0.53
2:D:131:GLU:OE2	2:D:170:ARG:HD2	2.09	0.53
1:C:134:GLY:HA3	1:C:153:TRP:HB3	1.92	0.52
1:E:203:THR:OG1	1:E:246:THR:HB	2.09	0.52
1:C:237:LEU:HD22	1:C:243:VAL:HG23	1.92	0.52
1:A:15:LEU:HD22	2:B:119:TYR:HA	1.93	0.51
1:E:302:VAL:HG11	2:F:65:LEU:HG	1.93	0.51
1:A:205:ARG:HG2	1:A:210:GLN:HG3	1.93	0.50
2:B:125:GLN:NE2	2:B:155:ASN:HA	2.26	0.50
1:C:116:GLY:HA2	1:C:265:SER:HB3	1.92	0.50
1:A:30:THR:O	2:F:50:GLY:HA3	2.12	0.49
2:D:50:GLY:HA3	1:E:30:THR:O	2.13	0.48
1:A:28:THR:HB	2:B:105:GLN:OE1	2.13	0.48
1:E:60:ASP:HB2	1:E:274:LEU:HD11	1.96	0.48
1:C:52:CYS:HB3	1:C:277:CYS:O	2.15	0.47
1:A:42:THR:HG22	1:A:314:LEU:HB2	1.95	0.47
1:A:219:ALA:HB1	1:E:210:GLN:HG2	1.97	0.46
1:C:158(B):ASN:HA	1:C:192:THR:O	2.15	0.46
1:A:70:LEU:HD11	1:A:112:LEU:HD11	1.97	0.46
1:A:201:LEU:HD21	1:C:219:ALA:HB2	1.98	0.46
1:A:131:ARG:HB2	1:A:155:LEU:HD12	1.98	0.46
2:F:47:GLN:HB3	2:F:110:LEU:HD11	1.98	0.46
1:C:71:ILE:HG22	1:C:151:MET:HE3	1.98	0.45
1:A:57:ARG:O	1:A:84:SER:HB2	2.15	0.45
1:C:192:THR:HG22	1:C:197:SER:HA	1.98	0.45
1:E:191:GLN:OE1	1:E:217:PRO:HG3	2.17	0.44
1:E:325:GLU:OE2	1:E:325:GLU:HA	2.17	0.44
1:A:42:THR:HG22	1:A:314:LEU:O	2.16	0.44
1:A:52:CYS:HB3	1:A:277:CYS:O	2.18	0.44
1:A:135:ALA:HB1	1:A:145:SER:O	2.17	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:237:LEU:HD22	1:C:243:VAL:CG2	2.47	0.43
2:F:74:GLU:HG3	2:F:77:ILE:HD13	1.98	0.43
1:A:161:PHE:HA	1:A:162:PRO:HD3	1.89	0.43
2:F:48:ILE:HD11	2:F:107:THR:HG23	2.00	0.43
1:C:237:LEU:HD13	1:C:243:VAL:HG22	2.00	0.43
1:E:307:ARG:NH2	2:F:60:ASN:OD1	2.52	0.43
2:B:66:ILE:HG12	2:D:83:TRP:CD2	2.54	0.43
1:C:219:ALA:O	1:C:229:ARG:HG2	2.19	0.43
2:D:86:ASP:O	2:D:90:GLU:HG2	2.18	0.43
1:A:134:GLY:HA3	1:A:153:TRP:HB3	2.01	0.43
1:E:132:THR:HG23	1:E:152:LYS:HD2	2.00	0.42
1:A:229:ARG:HH12	1:E:210:GLN:HB3	1.85	0.42
1:A:181:GLY:HA3	1:A:252:ILE:HB	2.01	0.42
1:C:60:ASP:HB2	1:C:274:LEU:HD11	2.02	0.42
1:A:180:TRP:CE2	1:A:204:VAL:HG21	2.55	0.42
2:B:88:MET:HE1	2:F:88:MET:HE1	2.01	0.41
1:A:70:LEU:HD21	1:A:112:LEU:HD21	2.02	0.41
3:G:1:NAG:H61	3:G:2:NAG:C1	2.50	0.41
1:C:71:ILE:O	1:C:148:TYR:HB3	2.19	0.41
1:A:184:HIS:HB2	1:A:229:ARG:HB3	2.02	0.41
1:C:106:GLU:HG2	2:D:73:ILE:HG22	2.02	0.41
1:A:305:CYS:HB2	2:B:63:PHE:CD2	2.56	0.41
2:D:88:MET:HE3	2:D:88:MET:HA	2.03	0.41
2:B:141:PHE:CG	2:B:170:ARG:HG2	2.56	0.40
1:A:116:GLY:HA2	1:A:265:SER:HB3	2.03	0.40
1:E:316:LEU:HD22	2:F:55:LEU:HD12	2.02	0.40
1:C:15:LEU:HD12	2:D:138:PHE:HE1	1.86	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	308/317 (97%)	293 (95%)	15 (5%)	0	100	100
1	C	306/317 (96%)	297 (97%)	8 (3%)	1 (0%)	36	58
1	E	307/317 (97%)	299 (97%)	7 (2%)	1 (0%)	36	58
2	B	172/182 (94%)	166 (96%)	6 (4%)	0	100	100
2	D	171/182 (94%)	166 (97%)	5 (3%)	0	100	100
2	F	170/182 (93%)	165 (97%)	5 (3%)	0	100	100
All	All	1434/1497 (96%)	1386 (97%)	46 (3%)	2 (0%)	48	70

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	E	324	PRO
1	C	220	ARG

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	265/271 (98%)	261 (98%)	4 (2%)	57	80
1	C	264/271 (97%)	254 (96%)	10 (4%)	29	56
1	E	264/271 (97%)	256 (97%)	8 (3%)	36	64
2	B	149/155 (96%)	143 (96%)	6 (4%)	28	55
2	D	148/155 (96%)	142 (96%)	6 (4%)	27	54
2	F	147/155 (95%)	143 (97%)	4 (3%)	39	67
All	All	1237/1278 (97%)	1199 (97%)	38 (3%)	35	63

All (38) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	94	THR
1	A	146	SER
1	A	155	LEU

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Mol	Chain	Res	Type
1	A	237	LEU
2	B	32	GLU
2	B	39	LYS
2	B	52	LEU
2	B	66	ILE
2	B	154	ASN
2	B	155	ASN
1	C	75	GLN
1	C	85	ASP
1	C	96	ILE
1	C	155	LEU
1	C	201	LEU
1	C	203	THR
1	C	211	GLN
1	C	243	VAL
1	C	266	LEU
1	C	307	ARG
2	D	32	GLU
2	D	48	ILE
2	D	143	LYS
2	D	155	ASN
2	D	160	THR
2	D	171	ILE
1	E	30	THR
1	E	75	GLN
1	E	132	THR
1	E	141	ARG
1	E	201	LEU
1	E	240	ASN
1	E	264	GLU
1	E	307	ARG
2	F	32	GLU
2	F	48	ILE
2	F	102	MET
2	F	147	GLN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (8) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	54	GLN
1	A	191	GLN
1	C	191	GLN

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Mol	Chain	Res	Type
1	C	296	ASN
2	D	12	ASN
1	E	54	GLN
1	E	296	ASN
2	F	147	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 ⓘ

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	$\# Z > 2$
3	NAG	G	1	3,2	14,14,15	0.47	0	17,19,21	0.90	0
3	NAG	G	2	3	14,14,15	0.59	0	17,19,21	1.29	3 (17%)
3	NAG	H	1	3,1	14,14,15	0.54	0	17,19,21	0.77	1 (5%)
3	NAG	H	2	3	14,14,15	0.45	0	17,19,21	1.33	1 (5%)
3	NAG	I	1	3,2	14,14,15	0.49	0	17,19,21	0.85	1 (5%)
3	NAG	I	2	3	14,14,15	0.54	0	17,19,21	1.24	1 (5%)

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	NAG	G	1	3,2	-	2/6/23/26	0/1/1/1
3	NAG	G	2	3	-	2/6/23/26	0/1/1/1
3	NAG	H	1	3,1	-	0/6/23/26	0/1/1/1
3	NAG	H	2	3	-	0/6/23/26	0/1/1/1
3	NAG	I	1	3,2	-	0/6/23/26	0/1/1/1
3	NAG	I	2	3	-	2/6/23/26	0/1/1/1

There are no bond length outliers.

All (7) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	H	2	NAG	C1-O5-C5	4.94	118.81	112.19
3	G	2	NAG	C2-N2-C7	3.58	127.69	122.90
3	I	2	NAG	C2-N2-C7	3.19	127.17	122.90
3	H	1	NAG	C4-C3-C2	2.48	114.66	111.02
3	I	1	NAG	C1-O5-C5	2.17	115.10	112.19
3	G	2	NAG	O7-C7-N2	2.10	125.70	121.98
3	G	2	NAG	O5-C5-C6	2.02	111.60	107.66

There are no chirality outliers.

All (6) torsion outliers are listed below:

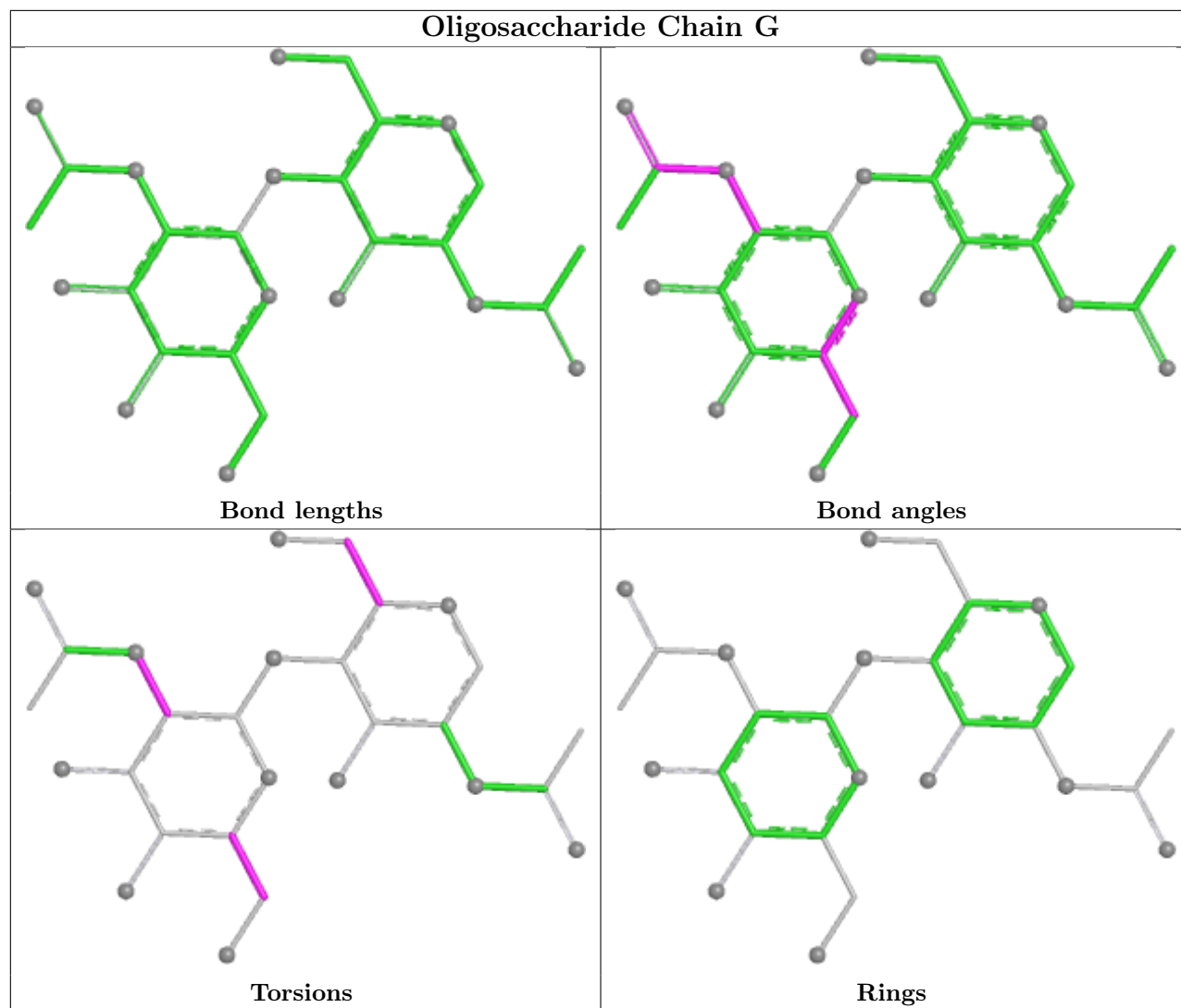
Mol	Chain	Res	Type	Atoms
3	G	1	NAG	O5-C5-C6-O6
3	G	1	NAG	C4-C5-C6-O6
3	G	2	NAG	C3-C2-N2-C7
3	I	2	NAG	C3-C2-N2-C7
3	I	2	NAG	C4-C5-C6-O6
3	G	2	NAG	C4-C5-C6-O6

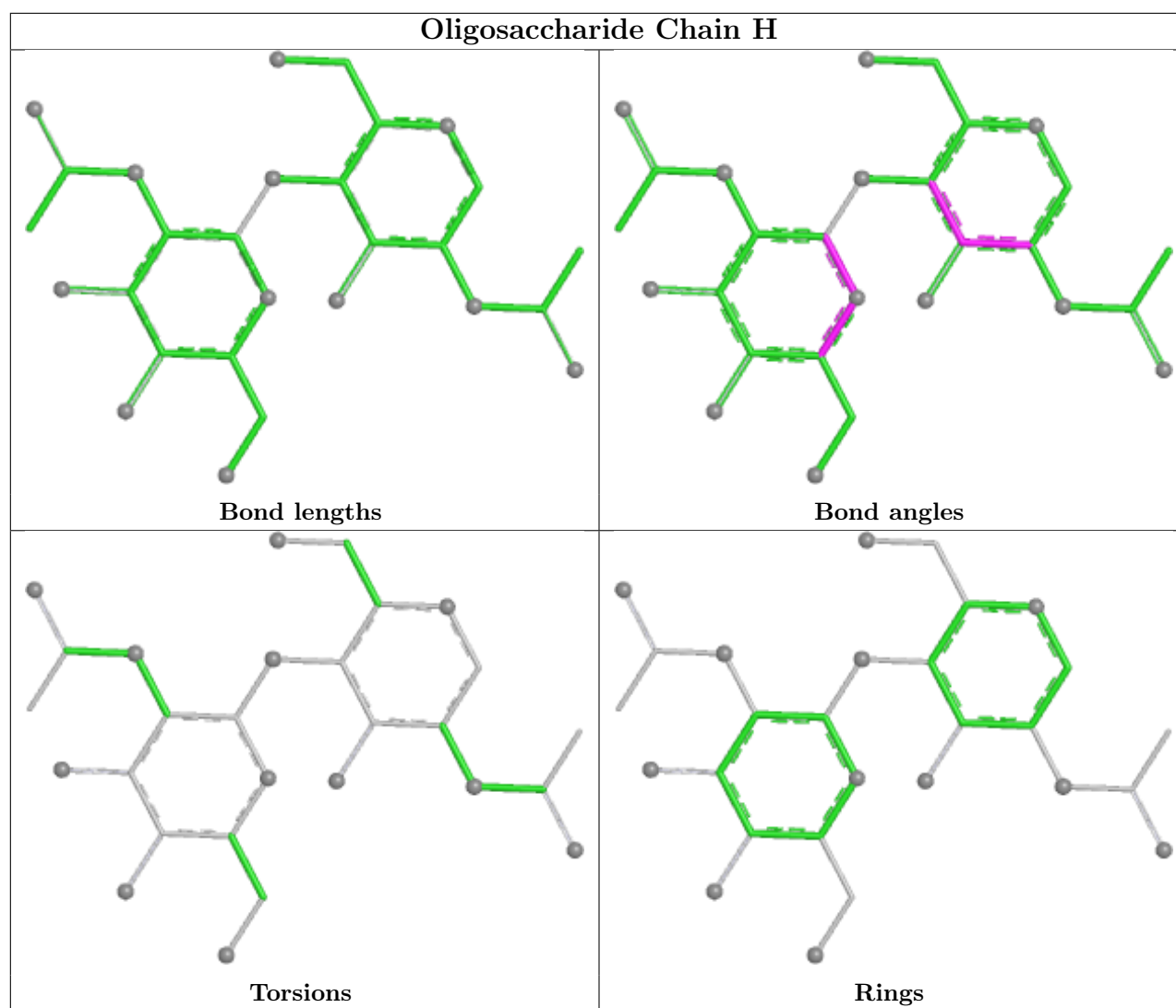
There are no ring outliers.

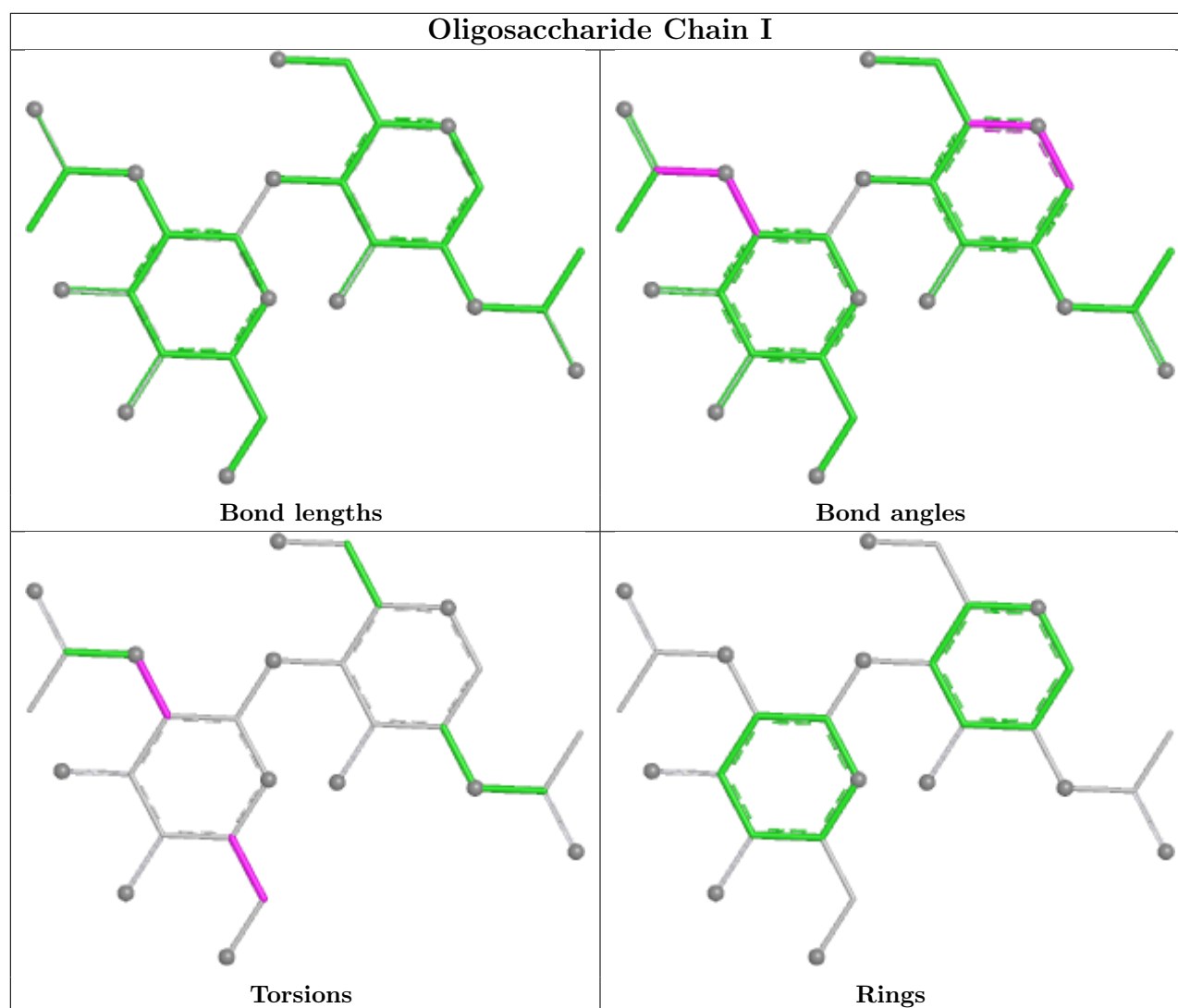
2 monomers are involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	G	1	NAG	1	0
3	G	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](#)

5 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	$\# Z > 2$
4	NAG	A	1	1	14,14,15	0.59	0	17,19,21	1.57	3 (17%)
4	NAG	E	1	1	14,14,15	0.52	0	17,19,21	1.27	2 (11%)
4	NAG	D	183	2	14,14,15	0.60	0	17,19,21	0.90	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
5	PEG	B	185	-	6,6,6	0.52	0	5,5,5	0.19	0
5	PEG	B	186	-	6,6,6	0.53	0	5,5,5	0.27	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
4	NAG	A	1	1	-	3/6/23/26	0/1/1/1
4	NAG	E	1	1	1/1/5/7	1/6/23/26	0/1/1/1
4	NAG	D	183	2	-	2/6/23/26	0/1/1/1
5	PEG	B	185	-	-	3/4/4/4	-
5	PEG	B	186	-	-	2/4/4/4	-

There are no bond length outliers.

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	A	1	NAG	C2-N2-C7	3.49	127.58	122.90
4	E	1	NAG	O5-C1-C2	3.10	116.09	111.29
4	A	1	NAG	C3-C4-C5	2.93	115.55	110.23
4	A	1	NAG	C4-C3-C2	2.49	114.66	111.02
4	E	1	NAG	C1-C2-N2	-2.07	107.17	110.43

All (1) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
4	E	1	NAG	C1

All (11) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	B	186	PEG	O1-C1-C2-O2
4	D	183	NAG	C4-C5-C6-O6
4	A	1	NAG	C1-C2-N2-C7
5	B	185	PEG	C4-C3-O2-C2
4	D	183	NAG	O5-C5-C6-O6
4	A	1	NAG	C4-C5-C6-O6
5	B	185	PEG	O2-C3-C4-O4

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Mol	Chain	Res	Type	Atoms
4	E	1	NAG	C4-C5-C6-O6
4	A	1	NAG	C3-C2-N2-C7
5	B	186	PEG	C1-C2-O2-C3
5	B	185	PEG	O1-C1-C2-O2

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](#)

The following chains have linkage breaks:

Mol	Chain	Number of breaks
1	E	1

All chain breaks are listed below:

Model	Chain	Residue-1	Atom-1	Residue-2	Atom-2	Distance (Å)
1	E	93:GLY	C	94:THR	N	1.14

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	310/317 (97%)	0.35	11 (3%)	47 41	8, 16, 25, 48	0
1	C	308/317 (97%)	0.32	7 (2%)	61 55	9, 16, 23, 40	0
1	E	309/317 (97%)	0.23	11 (3%)	46 40	9, 16, 22, 41	0
2	B	174/182 (95%)	0.29	3 (1%)	69 64	6, 17, 23, 40	0
2	D	173/182 (95%)	0.43	7 (4%)	42 37	9, 16, 22, 35	0
2	F	172/182 (94%)	0.37	5 (2%)	53 48	8, 16, 22, 24	0
All	All	1446/1497 (96%)	0.32	44 (3%)	52 47	6, 16, 23, 48	0

All (44) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	144	GLY	10.6
1	A	145	SER	9.1
2	D	173	ILE	4.6
1	A	142	SER	3.9
1	A	277	CYS	3.6
2	B	71	ASN	3.4
1	A	326	LYS	3.3
1	E	22	ASN	3.1
1	E	173	ASN	3.1
1	E	11	ASP	3.1
1	E	196	GLY	3.1
2	F	27	GLN	3.0
2	F	33	GLY	2.9
1	A	141	ARG	2.8
1	C	277	CYS	2.8
1	E	277	CYS	2.7
1	E	142	SER	2.7
2	B	32	GLU	2.7
1	A	219	ALA	2.6

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Mol	Chain	Res	Type	RSRZ
1	A	140	THR	2.6
2	F	144	CYS	2.6
1	E	10	GLY	2.4
2	F	11	GLU	2.4
1	C	144	GLY	2.4
1	C	271	ASP	2.3
1	E	199	ASN	2.3
1	A	146	SER	2.3
2	D	31	GLY	2.3
1	C	11	ASP	2.2
1	A	199	ASN	2.2
1	A	271	ASP	2.2
1	E	12	LYS	2.2
1	C	219	ALA	2.2
1	E	325	GLU	2.1
2	F	139	GLU	2.1
2	D	172	GLN	2.1
2	D	154	ASN	2.1
2	D	150	GLU	2.0
1	C	142	SER	2.0
1	C	216	ASN	2.0
1	E	216	ASN	2.0
2	D	69	GLU	2.0
2	D	74	GLU	2.0
2	B	62	GLN	2.0

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

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

6.3 Carbohydrates ⓘ

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.

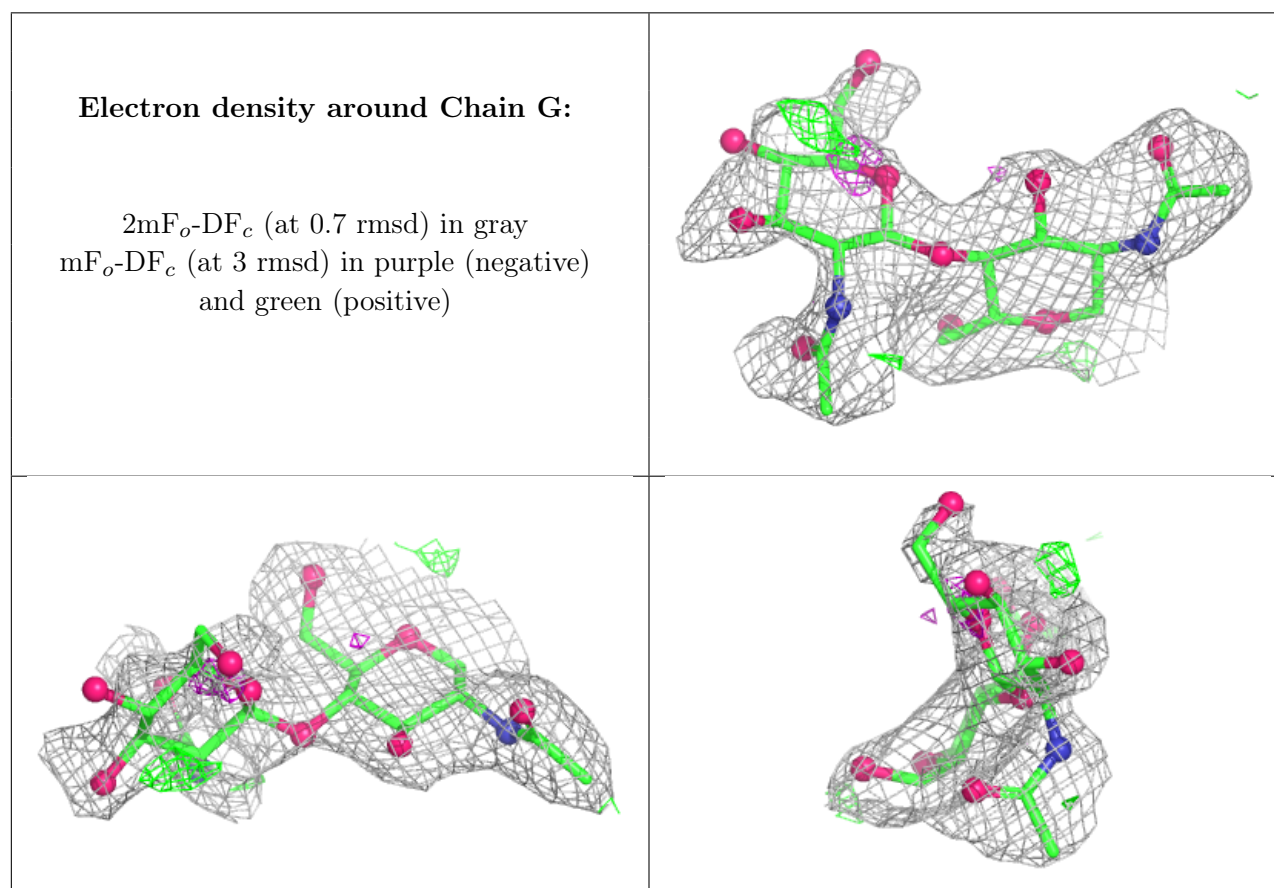
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
3	NAG	G	2	14/15	0.63	0.18	39,43,44,45	0
3	NAG	I	2	14/15	0.69	0.16	38,42,46,46	0
3	NAG	H	2	14/15	0.70	0.14	37,45,47,50	0

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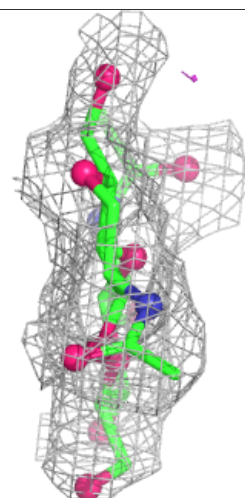
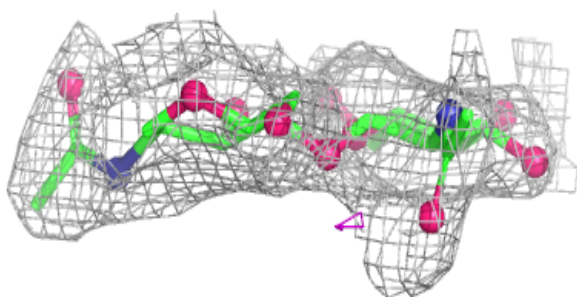
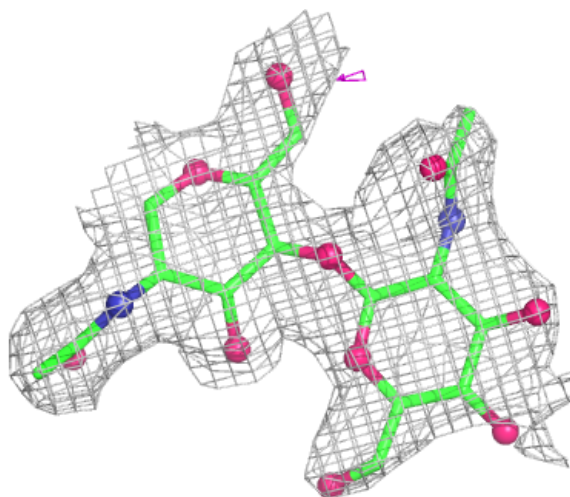
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
3	NAG	H	1	14/15	0.72	0.14	38,42,44,45	0
3	NAG	G	1	14/15	0.88	0.10	21,27,33,36	0
3	NAG	I	1	14/15	0.91	0.09	27,30,34,38	0

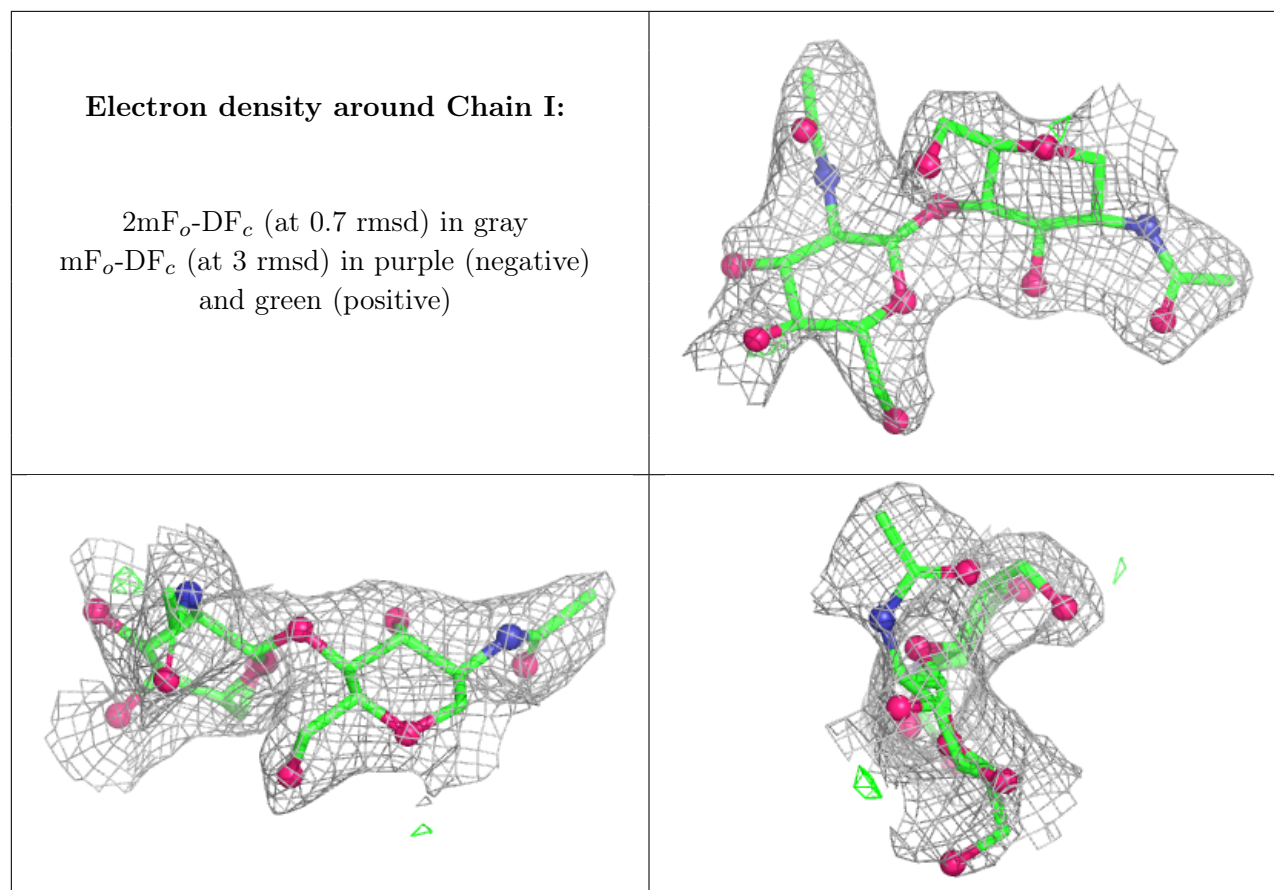
The following is a graphical depiction of the model fit to experimental electron density for oligosaccharide. Each fit is shown from different orientation to approximate a three-dimensional view.



Electron density around Chain H:

$2mF_o-DF_c$ (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
4	NAG	A	1	14/15	0.69	0.17	36,41,45,46	0
4	NAG	E	1	14/15	0.72	0.16	38,43,45,47	0
5	PEG	B	185	7/7	0.73	0.23	34,42,43,45	0
5	PEG	B	186	7/7	0.79	0.30	32,35,41,42	0
4	NAG	D	183	14/15	0.81	0.12	31,35,36,36	0

6.5 Other polymers [i](#)

There are no such residues in this entry.