



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 8, 2026 – 04:41 PM UTC

PDB ID : 3B9F / pdb_00003b9f
Title : 1.6 Å structure of the PCI-thrombin-heparin complex
Authors : Li, W.; Adams, T.E.; Huntington, J.A.
Deposited on : 2007-11-05
Resolution : 1.60 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

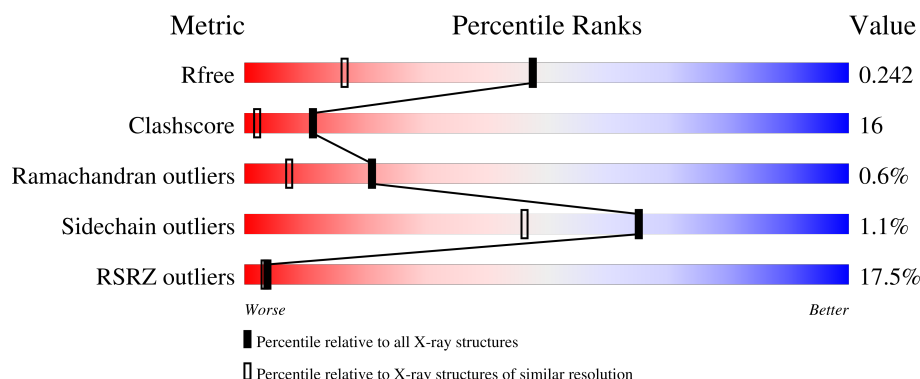
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.60 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	4673 (1.60-1.60)
Clashscore	190562	4931 (1.60-1.60)
Ramachandran outliers	187476	4831 (1.60-1.60)
Sidechain outliers	187428	4830 (1.60-1.60)
RSRZ outliers	180081	4672 (1.60-1.60)

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	L	49	4% 78% 12% 10%
2	H	259	10% 68% 29% ..
3	I	395	22% 65% 24% • 10%
4	A	2	50% 50%
5	B	2	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
7	GOL	I	390	-	-	X	-

2 Entry composition

There are 8 unique types of molecules in this entry. The entry contains 6092 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 Prothrombin.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	L	44	Total	C	N	O	S	0	2	0
			377	236	61	79	1			

- Molecule 2 is a protein called Prothrombin.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	H	253	Total	C	N	O	S	0	34	0
			2294	1456	412	410	16			

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
H	195	ALA	SER	engineered mutation	UNP P00734

- Molecule 3 is a protein called Plasma serine protease inhibitor.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	I	356	Total	C	N	O	S	5	9	0
			2798	1796	461	524	17			

There are 25 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
I	-7	MET	-	expression tag	UNP P05154
I	-6	GLY	-	expression tag	UNP P05154
I	-5	HIS	-	expression tag	UNP P05154
I	-4	HIS	-	expression tag	UNP P05154
I	-3	HIS	-	expression tag	UNP P05154
I	-2	HIS	-	expression tag	UNP P05154
I	-1	HIS	-	expression tag	UNP P05154
I	0	HIS	-	expression tag	UNP P05154
I	1	HIS	-	expression tag	UNP P05154

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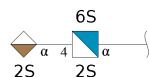
Chain	Residue	Modelled	Actual	Comment	Reference
I	2	HIS	-	expression tag	UNP P05154
I	3	HIS	-	expression tag	UNP P05154
I	4	HIS	-	expression tag	UNP P05154
I	5	SER	-	expression tag	UNP P05154
I	6	SER	-	expression tag	UNP P05154
I	7	GLY	-	expression tag	UNP P05154
I	8	HIS	-	expression tag	UNP P05154
I	9	ILE	-	expression tag	UNP P05154
I	10	ASP	-	expression tag	UNP P05154
I	11	ASP	-	expression tag	UNP P05154
I	12	ASP	-	expression tag	UNP P05154
I	13	ASP	-	expression tag	UNP P05154
I	14	LYS	-	expression tag	UNP P05154
I	15	HIS	-	expression tag	UNP P05154
I	16	MET	-	expression tag	UNP P05154
I	45	ASN	SER	see sequence details	UNP P05154

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



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

- Molecule 5 is an oligosaccharide called 2-O-sulfo-alpha-L-idopyranuronic acid-(1-4)-2-deoxy-6-O-sulfo-2-(sulfoamino)-alpha-D-glucopyranose.



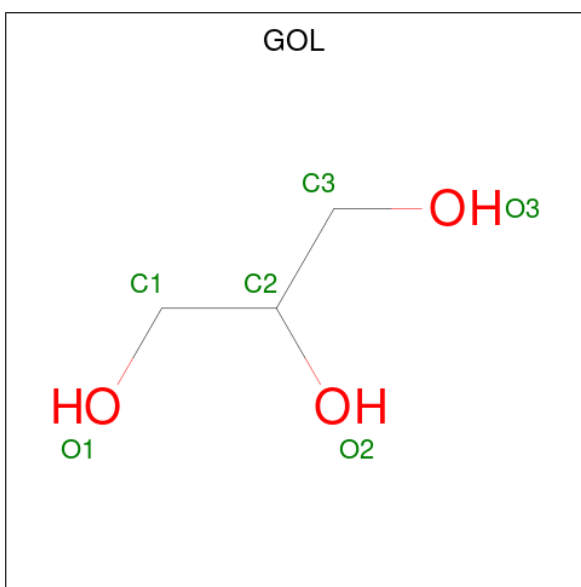
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
5	B	2	Total	C	N	O	S	0	0	0
			31	12	1	16	2			

- Molecule 6 is SULFATE ION (CCD ID: SO4) (formula: O₄S).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
6	H	1	Total	O	S	0	0
			5	4	1		
6	I	1	Total	O	S	0	0
			5	4	1		
6	I	1	Total	O	S	0	0
			5	4	1		

- Molecule 7 is GLYCEROL (CCD ID: GOL) (formula: C₃H₈O₃).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
7	H	1	Total	C	O	0	0
			6	3	3		

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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
7	H	1	Total	C	O	0	0
			6	3	3		
7	H	1	Total	C	O	0	0
			6	3	3		
7	I	1	Total	C	O	0	0
			6	3	3		
7	I	1	Total	C	O	0	0
			6	3	3		

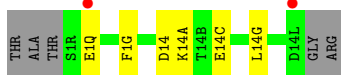
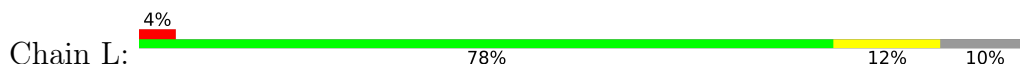
- Molecule 8 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
8	L	83	Total	O	0	0
			83	83		
8	H	272	Total	O	0	0
			272	272		
8	I	168	Total	O	0	0
			168	168		

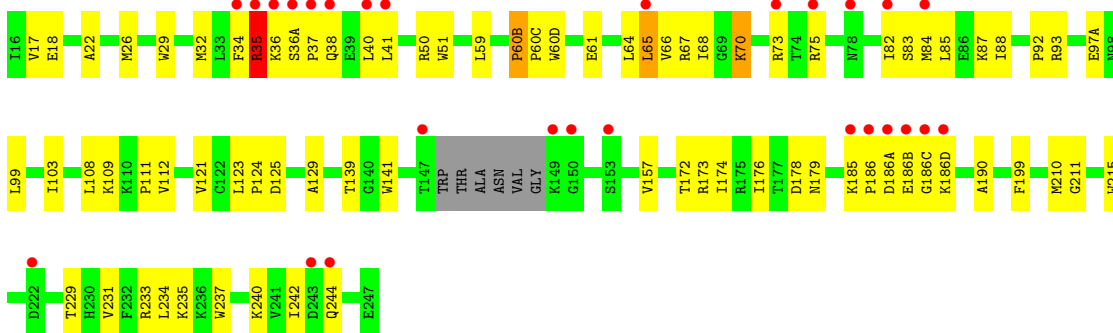
3 Residue-property plots [i](#)

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.

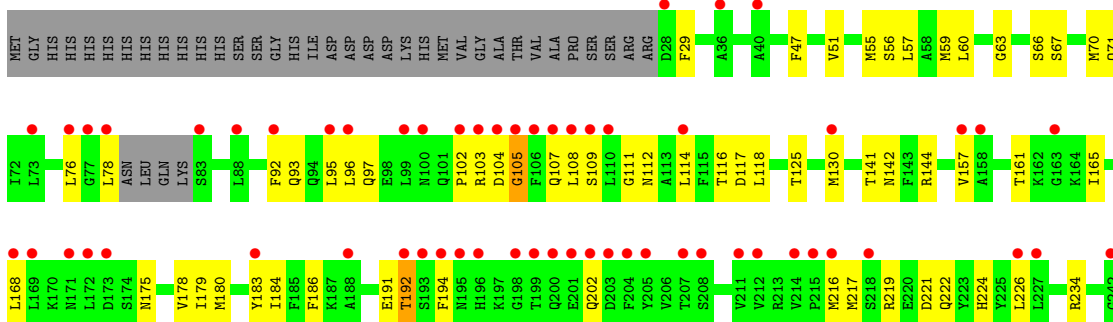
• Molecule 1: Prothrombin

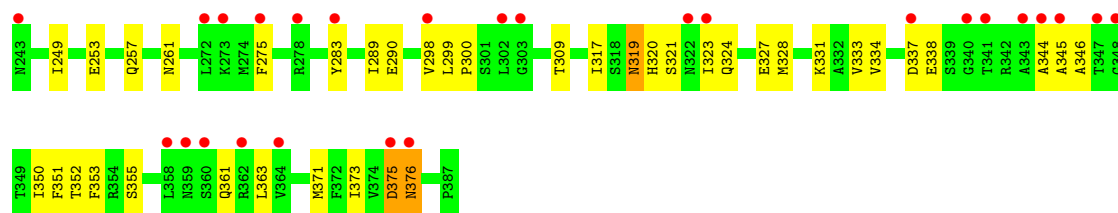


• Molecule 2: Prothrombin



• Molecule 3: Plasma serine protease inhibitor





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

Chain A: 50%



- Molecule 5: 2-O-sulfo-alpha-L-idopyranuronic acid-(1-4)-2-deoxy-6-O-sulfo-2-(sulfoamino)-alpha-D-glucopyranose

Chain B: 100%



4 Data and refinement statistics

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, α , β , γ	44.05Å 48.83Å 97.85Å 78.72° 81.52° 77.69°	Depositor
Resolution (Å)	30.95 – 1.60 30.95 – 1.60	Depositor EDS
% Data completeness (in resolution range)	93.4 (30.95-1.60) 93.5 (30.95-1.60)	Depositor EDS
R_{merge}	0.05	Depositor
R_{sym}	0.05	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.94 (at 1.60Å)	Xtriage
Refinement program	CNS 1.0	Depositor
R, R_{free}	0.208 , 0.234 0.218 , 0.242	Depositor DCC
R_{free} test set	2928 reflections (2.86%)	wwPDB-VP
Wilson B-factor (Å ²)	19.0	Xtriage
Anisotropy	0.068	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.37 , 58.7	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	0.96	EDS
Total number of atoms	6092	wwPDB-VP
Average B, all atoms (Å ²)	30.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.18% 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: GOL, NAG, SO4, SGN, IDS, 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	L	0.34	0/384	0.88	1/514 (0.2%)
2	H	0.33	0/2347	0.89	10/3169 (0.3%)
3	I	0.29	0/2851	0.83	7/3860 (0.2%)
All	All	0.31	0/5582	0.86	18/7543 (0.2%)

There are no bond length outliers.

All (18) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	I	376	ASN	N-CA-C	-7.41	104.04	113.23
1	L	14(A)	LYS	N-CA-C	7.35	120.16	111.71
3	I	375	ASP	N-CA-C	-7.24	97.70	108.34
2	H	35	ARG	N-CA-C	-6.67	100.33	110.14
2	H	125	ASP	N-CA-C	-6.66	100.94	110.59
3	I	224	HIS	N-CA-C	-5.68	101.23	109.59
2	H	123	LEU	N-CA-C	-5.60	102.59	110.31
2	H	97(A)	GLU	N-CA-C	5.59	119.67	111.34
2	H	124	PRO	N-CA-C	5.58	120.26	111.38
2	H	199	PHE	N-CA-C	-5.56	98.14	107.99
2	H	190	ALA	N-CA-C	-5.46	102.67	110.59
2	H	231	VAL	N-CA-C	5.34	115.55	110.42
3	I	191	GLU	N-CA-C	-5.34	105.36	111.07
3	I	321	SER	N-CA-C	5.32	118.93	112.23
3	I	373	ILE	N-CA-C	-5.23	100.02	107.77
3	I	355	SER	N-CA-C	-5.19	103.55	110.55
2	H	60(B)	PRO	N-CA-C	5.12	116.95	110.70
2	H	70	LYS	N-CA-C	5.03	117.34	110.55

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	L	377	0	352	4	0
2	H	2294	0	2224	88	0
3	I	2798	0	2718	93	0
4	A	24	0	22	1	0
5	B	31	0	13	7	0
6	H	5	0	0	0	0
6	I	10	0	0	0	0
7	H	18	0	24	1	0
7	I	12	0	16	7	0
8	H	272	0	0	4	0
8	I	168	0	0	6	0
8	L	83	0	0	1	0
All	All	6092	0	5369	178	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 16.

All (178) 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:H:185[A]:LYS:HB2	2:H:186[A]:PRO:C	1.77	1.09
2:H:185[A]:LYS:HB2	2:H:186(A)[A]:ASP:N	1.73	1.02
2:H:139:THR:HG22	2:H:157[A]:VAL:HG22	1.54	0.89
2:H:67[B]:ARG:HG2	2:H:82[B]:ILE:HD12	1.59	0.84
3:I:179:ILE:HD12	3:I:327:GLU:HB2	1.64	0.78
3:I:59:MET:HG2	3:I:130[A]:MET:SD	2.25	0.77
3:I:234:ARG:NH2	3:I:361:GLN:HE21	1.83	0.76
2:H:185[A]:LYS:HG3	2:H:186[A]:PRO:HA	1.70	0.73
2:H:185[A]:LYS:HB2	2:H:186[A]:PRO:CA	2.20	0.72
2:H:61:GLU:HG2	2:H:87:LYS:HA	1.71	0.71
3:I:60:LEU:HD12	3:I:180:MET:HE1	1.72	0.70
2:H:237:TRP:HB2	5:B:1:SGN:H61	1.76	0.68
3:I:353:PHE:H	7:I:390:GOL:C1	2.06	0.68
2:H:185[A]:LYS:HB3	2:H:186(B)[A]:GLU:HB2	1.76	0.67
2:H:35:ARG:HB3	2:H:41[A]:LEU:HD11	1.76	0.67

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:H:59:LEU:HD13	2:H:88[B]:ILE:HG21	1.77	0.66
2:H:61:GLU:CG	2:H:87:LYS:HA	2.25	0.66
2:H:68:ILE:HD12	2:H:112[A]:VAL:HG21	1.77	0.65
2:H:108:LEU:HD13	2:H:112[A]:VAL:HG23	1.79	0.65
2:H:174[B]:ILE:CD1	3:I:351:PHE:HB3	2.28	0.64
3:I:55[B]:MET:HG2	3:I:92:PHE:CD1	2.33	0.64
3:I:157:VAL:HG21	3:I:168:LEU:HD22	1.80	0.63
2:H:34:PHE:CE1	2:H:67[A]:ARG:HD3	2.33	0.63
3:I:59:MET:HE1	3:I:112:ASN:CB	2.29	0.62
2:H:179:ASN:ND2	5:B:1:SGN:O3S	2.29	0.62
2:H:64:LEU:HD12	2:H:88[B]:ILE:HD11	1.82	0.62
3:I:161:THR:HG21	3:I:165:ILE:HB	1.80	0.62
3:I:353:PHE:H	7:I:390:GOL:H12	1.64	0.61
3:I:202:GLN:HB2	3:I:216[B]:MET:HG3	1.83	0.61
3:I:59:MET:HE1	3:I:112:ASN:CG	2.26	0.61
2:H:61:GLU:H	2:H:61:GLU:CD	2.09	0.60
2:H:32[A]:MET:SD	2:H:70:LYS:HD3	2.40	0.60
3:I:180:MET:HE3	3:I:328:MET:HG3	1.82	0.60
1:L:1(Q):GLU:HG2	8:L:55:HOH:O	2.01	0.60
2:H:92:PRO:HG2	5:B:2:IDS:O6A	2.01	0.60
3:I:93:GLN:O	3:I:97:GLN:HG3	2.02	0.59
3:I:234:ARG:HH21	3:I:361:GLN:HE21	1.48	0.59
2:H:237:TRP:HD1	5:B:2:IDS:H3	1.69	0.58
3:I:178:VAL:HG21	3:I:323:ILE:HD11	1.85	0.58
2:H:93[A]:ARG:HG3	5:B:2:IDS:O6A	2.03	0.58
2:H:174[A]:ILE:HD11	3:I:350:ILE:HB	1.85	0.58
2:H:185[A]:LYS:HE2	2:H:186(D)[A]:LYS:O	2.04	0.58
2:H:36:LYS:NZ	2:H:84[B]:MET:HE1	2.19	0.57
2:H:173:ARG:NH2	3:I:350:ILE:HG23	2.20	0.57
3:I:47:PHE:CE1	3:I:371[B]:MET:HE3	2.40	0.56
3:I:116:THR:HG22	3:I:178:VAL:HG22	1.86	0.56
2:H:237:TRP:HB2	5:B:1:SGN:C6	2.35	0.56
3:I:55[B]:MET:HE1	3:I:96:LEU:HB2	1.87	0.56
3:I:111:GLY:HA3	3:I:183:TYR:CE1	2.40	0.56
2:H:60(D):TRP:CH2	7:I:390:GOL:H2	2.41	0.55
2:H:185[A]:LYS:HB3	2:H:186(B)[A]:GLU:N	2.21	0.55
2:H:185[A]:LYS:HZ2	2:H:186(C)[A]:GLY:C	2.14	0.55
3:I:108:LEU:C	3:I:108:LEU:HD23	2.31	0.55
3:I:344:ALA:HB3	8:I:528:HOH:O	2.07	0.55
1:L:14:ASP:HB2	2:H:26:MET:HE3	1.88	0.55
2:H:34:PHE:HB2	2:H:65:LEU:HD22	1.87	0.54

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:H:185[A]:LYS:CB	2:H:186(A)[A]:ASP:N	2.61	0.54
3:I:352:THR:HA	7:I:390:GOL:H11	1.90	0.54
2:H:185[A]:LYS:CB	2:H:186[A]:PRO:CA	2.86	0.53
3:I:118:LEU:HD11	3:I:142:ASN:HB2	1.90	0.53
3:I:319:ASN:C	3:I:319:ASN:HD22	2.16	0.53
3:I:67:SER:O	3:I:71:GLN:HG3	2.08	0.53
8:H:1014:HOH:O	4:A:1:NAG:H61	2.07	0.53
3:I:114:LEU:HD22	3:I:130[A]:MET:HE2	1.90	0.53
3:I:103:ARG:O	3:I:105:GLY:N	2.41	0.53
3:I:109:SER:O	3:I:184:ILE:HA	2.07	0.53
2:H:40[A]:LEU:C	2:H:40[A]:LEU:HD23	2.33	0.53
2:H:36:LYS:HZ1	2:H:84[B]:MET:HE1	1.74	0.53
2:H:65:LEU:C	2:H:65:LEU:HD23	2.32	0.52
2:H:75[B]:ARG:HH11	2:H:75[B]:ARG:HG2	1.74	0.52
2:H:99:LEU:HD12	2:H:215:TRP:HB3	1.89	0.52
3:I:66:SER:O	3:I:70:MET:HG3	2.10	0.52
2:H:240[B]:LYS:CG	2:H:244[B]:GLN:HE21	2.23	0.52
1:L:14(C):GLU:O	1:L:14(G):LEU:HD23	2.10	0.51
3:I:161:THR:HG21	3:I:165:ILE:HD12	1.91	0.51
3:I:217:MET:SD	3:I:338:GLU:HG3	2.50	0.51
2:H:34:PHE:HB2	2:H:65:LEU:CD2	2.40	0.51
2:H:22:ALA:HB2	2:H:157[A]:VAL:HG23	1.91	0.51
3:I:95:LEU:C	3:I:95:LEU:HD23	2.36	0.51
3:I:353:PHE:H	7:I:390:GOL:H11	1.74	0.51
2:H:111:PRO:HD3	7:H:4:GOL:H32	1.92	0.51
2:H:174[B]:ILE:HD12	2:H:215:TRP:CZ3	2.46	0.51
3:I:165:ILE:HG23	3:I:331:LYS:HD3	1.93	0.51
3:I:63:GLY:HA3	3:I:317:ILE:HG13	1.93	0.50
3:I:59:MET:HE1	3:I:112:ASN:HB3	1.92	0.50
3:I:344:ALA:O	3:I:345:ALA:HB2	2.12	0.50
2:H:85[A]:LEU:HD22	2:H:85[A]:LEU:N	2.26	0.50
3:I:125[A]:THR:HG23	8:I:490:HOH:O	2.10	0.50
3:I:253:GLU:HG2	8:I:520:HOH:O	2.12	0.50
3:I:29:PHE:HB3	7:I:391:GOL:O1	2.12	0.50
2:H:50[B]:ARG:HG3	2:H:51:TRP:CD1	2.47	0.49
2:H:35:ARG:NH1	2:H:37:PRO:HD2	2.27	0.49
2:H:64:LEU:HD12	2:H:88[B]:ILE:CD1	2.41	0.49
3:I:47:PHE:HE1	3:I:371[B]:MET:HE3	1.77	0.49
3:I:192:THR:OG1	3:I:344:ALA:CB	2.60	0.49
2:H:17:VAL:HG12	2:H:18:GLU:HG2	1.94	0.49
2:H:32[A]:MET:HG2	2:H:141:TRP:CZ3	2.47	0.49

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:H:73[A]:ARG:O	2:H:73[A]:ARG:HD3	2.13	0.49
3:I:125[A]:THR:HG22	8:I:447:HOH:O	2.12	0.49
3:I:179:ILE:CD1	3:I:327:GLU:HB2	2.37	0.49
3:I:226[A]:LEU:C	3:I:226[A]:LEU:HD13	2.38	0.48
3:I:249:ILE:HD12	3:I:249:ILE:N	2.28	0.48
3:I:59:MET:CG	3:I:130[A]:MET:SD	2.99	0.48
2:H:61:GLU:HB3	2:H:85[A]:LEU:O	2.14	0.48
2:H:103:ILE:HG21	2:H:234[A]:LEU:HD13	1.95	0.48
2:H:185[A]:LYS:CG	2:H:186[A]:PRO:HA	2.42	0.48
2:H:88[A]:ILE:C	2:H:88[A]:ILE:HD12	2.38	0.48
2:H:34:PHE:CE1	2:H:67[B]:ARG:HD2	2.48	0.47
3:I:257:GLN:NE2	3:I:261:ASN:ND2	2.61	0.47
2:H:67[B]:ARG:NH1	2:H:82[B]:ILE:CD1	2.77	0.47
2:H:172:THR:HG21	2:H:176:ILE:HD11	1.97	0.47
3:I:175:ASN:HD22	3:I:175:ASN:N	2.13	0.47
2:H:185[A]:LYS:HZ2	2:H:186(D)[A]:LYS:N	2.13	0.47
3:I:309:THR:C	3:I:324:GLN:NE2	2.73	0.47
3:I:114:LEU:HD13	3:I:130[A]:MET:HE1	1.95	0.47
2:H:185[A]:LYS:HB3	2:H:186(B)[A]:GLU:CB	2.44	0.47
2:H:60(B):PRO:HB2	2:H:60(C):PRO:HD3	1.97	0.47
2:H:67[A]:ARG:HG2	2:H:82[A]:ILE:HG12	1.96	0.47
3:I:107:GLN:O	3:I:186:PHE:HA	2.15	0.47
2:H:35:ARG:O	2:H:38:GLN:HA	2.15	0.47
3:I:178:VAL:CG2	3:I:323:ILE:HD11	2.45	0.47
2:H:173:ARG:HH21	3:I:350:ILE:HG23	1.80	0.46
2:H:174[B]:ILE:HD11	3:I:351:PHE:HB3	1.97	0.46
2:H:38:GLN:O	2:H:38:GLN:HG3	2.16	0.46
2:H:68:ILE:CD1	2:H:112[A]:VAL:HG21	2.44	0.46
2:H:129:ALA:HA	2:H:210:MET:HE1	1.98	0.46
3:I:56[B]:SER:OG	3:I:328:MET:HE3	2.16	0.46
3:I:186:PHE:HB3	3:I:334:VAL:HG22	1.96	0.45
3:I:60:LEU:HD23	3:I:60:LEU:O	2.15	0.45
3:I:298:VAL:HG12	8:I:559:HOH:O	2.15	0.45
3:I:55[B]:MET:HE1	3:I:96:LEU:HD13	1.99	0.45
3:I:290:GLU:HB2	3:I:333:VAL:HG22	1.98	0.45
2:H:29:TRP:CG	2:H:121:VAL:HB	2.52	0.44
2:H:35:ARG:HH11	2:H:37:PRO:HD2	1.82	0.44
3:I:234:ARG:CZ	3:I:363:LEU:HD13	2.48	0.44
2:H:32[B]:MET:SD	2:H:34:PHE:CZ	3.11	0.44
2:H:35:ARG:HD3	2:H:37:PRO:O	2.18	0.44
2:H:75[A]:ARG:NH2	8:H:1016:HOH:O	2.50	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:I:144:ARG:HA	3:I:144:ARG:HD3	1.81	0.43
3:I:216[B]:MET:HE3	3:I:283:TYR:HB3	2.01	0.43
2:H:67[B]:ARG:HH11	2:H:82[B]:ILE:CD1	2.31	0.43
3:I:117:ASP:HA	3:I:141:THR:O	2.18	0.43
1:L:1(G):PHE:HD1	2:H:242:ILE:HD13	1.83	0.43
2:H:109:LYS:HB3	8:H:1018:HOH:O	2.19	0.43
3:I:194:PHE:O	3:I:338:GLU:HB3	2.19	0.43
3:I:319:ASN:HD22	3:I:320:HIS:N	2.17	0.43
3:I:319:ASN:C	3:I:319:ASN:ND2	2.77	0.42
3:I:165:ILE:HD13	3:I:183:TYR:HB2	2.01	0.42
3:I:221:ASP:CG	3:I:222:GLN:H	2.26	0.42
2:H:66:VAL:HG22	2:H:83[B]:SER:O	2.19	0.42
3:I:192:THR:OG1	3:I:344:ALA:HB1	2.20	0.42
3:I:202:GLN:HG3	8:I:455:HOH:O	2.21	0.41
2:H:59:LEU:HD22	2:H:64:LEU:HD11	2.02	0.41
3:I:192:THR:OG1	3:I:344:ALA:HB2	2.20	0.41
3:I:257:GLN:HE21	3:I:261:ASN:CG	2.28	0.41
3:I:375:ASP:HB3	3:I:376:ASN:H	1.56	0.41
2:H:178:ASP:O	2:H:233:ARG:HD2	2.20	0.41
3:I:299:LEU:N	3:I:300:PRO:CD	2.84	0.41
2:H:32[A]:MET:CG	2:H:141:TRP:CZ3	3.02	0.41
2:H:235:LYS:NZ	8:H:951:HOH:O	2.54	0.41
2:H:36:LYS:O	2:H:36(A):SER:C	2.64	0.41
2:H:75[B]:ARG:HG2	2:H:75[B]:ARG:NH1	2.34	0.41
3:I:51:VAL:O	3:I:55[B]:MET:HG3	2.21	0.41
3:I:257:GLN:HE22	3:I:261:ASN:HD21	1.69	0.41
3:I:290:GLU:CB	3:I:333:VAL:HG22	2.51	0.41
2:H:240[B]:LYS:O	2:H:244[B]:GLN:HG3	2.21	0.41
3:I:114:LEU:HD13	3:I:130[A]:MET:CE	2.51	0.41
3:I:309:THR:C	3:I:324:GLN:HE21	2.29	0.41
3:I:95:LEU:HD23	3:I:95:LEU:O	2.20	0.40
3:I:289:ILE:HG21	3:I:371[B]:MET:HE1	2.04	0.40
2:H:93[A]:ARG:NH2	5:B:1:SGN:N2	2.68	0.40
3:I:57:LEU:HB2	3:I:76:LEU:HD21	2.03	0.40
2:H:211:GLY:HA2	2:H:229:THR:O	2.21	0.40
2:H:174[B]:ILE:HD13	3:I:351:PHE:HB3	2.00	0.40
3:I:192:THR:OG1	3:I:219:ARG:NH1	2.54	0.40
3:I:257:GLN:NE2	3:I:261:ASN:HD21	2.19	0.40
3:I:353:PHE:CD1	7:I:390:GOL:H12	2.57	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	L	44/49 (90%)	43 (98%)	1 (2%)	0	100	100
2	H	282/259 (109%)	275 (98%)	7 (2%)	0	100	100
3	I	361/395 (91%)	337 (93%)	20 (6%)	4 (1%)	11	2
All	All	687/703 (98%)	655 (95%)	28 (4%)	4 (1%)	21	7

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
3	I	104	ASP
3	I	346	ALA
3	I	105	GLY
3	I	102	PRO

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	L	42/43 (98%)	42 (100%)	0	100	100
2	H	241/224 (108%)	239 (99%)	2 (1%)	73	59
3	I	296/347 (85%)	292 (99%)	4 (1%)	59	38
All	All	579/614 (94%)	573 (99%)	6 (1%)	65	50

All (6) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	H	35	ARG
2	H	65	LEU
3	I	78	LEU
3	I	192	THR
3	I	275	PHE
3	I	319	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (12) such sidechains are listed below:

Mol	Chain	Res	Type
2	H	38	GLN
3	I	97	GLN
3	I	142	ASN
3	I	175	ASN
3	I	195	ASN
3	I	196	HIS
3	I	257	GLN
3	I	261	ASN
3	I	294	GLN
3	I	319	ASN
3	I	324	GLN
3	I	361	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 ⓘ

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	$\# Z > 2$
4	NAG	A	1	2,4	14,14,15	0.53	0	17,19,21	0.72	1 (5%)
4	FUC	A	2	4	10,10,11	0.47	0	14,14,16	0.32	0
5	SGN	B	1	5	16,16,20	3.66	3 (18%)	19,24,31	1.33	1 (5%)
5	IDS	B	2	5	15,15,17	1.57	2 (13%)	14,22,26	1.30	1 (7%)

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	2,4	-	3/6/23/26	0/1/1/1
4	FUC	A	2	4	-	-	0/1/1/1
5	SGN	B	1	5	-	3/7/27/31	0/1/1/1
5	IDS	B	2	5	-	1/9/22/29	1/1/1/1

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	B	1	SGN	O2S-S1	10.04	1.53	1.42
5	B	1	SGN	O1S-S1	9.94	1.53	1.42
5	B	2	IDS	O2-S	-4.44	1.44	1.57
5	B	1	SGN	S1-N2	3.24	1.63	1.59
5	B	2	IDS	O2-C2	-2.26	1.44	1.47

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	B	1	SGN	O1S-S1-O2S	-4.97	109.29	120.36
5	B	2	IDS	O6A-C6-C5	-2.77	116.86	122.85
4	A	1	NAG	C2-N2-C7	-2.02	120.19	122.90

There are no chirality outliers.

All (7) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	A	1	NAG	C8-C7-N2-C2

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Mol	Chain	Res	Type	Atoms
4	A	1	NAG	O7-C7-N2-C2
5	B	1	SGN	C1-C2-N2-S1
5	B	1	SGN	C3-C2-N2-S1
5	B	1	SGN	C2-N2-S1-O2S
4	A	1	NAG	C3-C2-N2-C7
5	B	2	IDS	O5-C5-C6-O6A

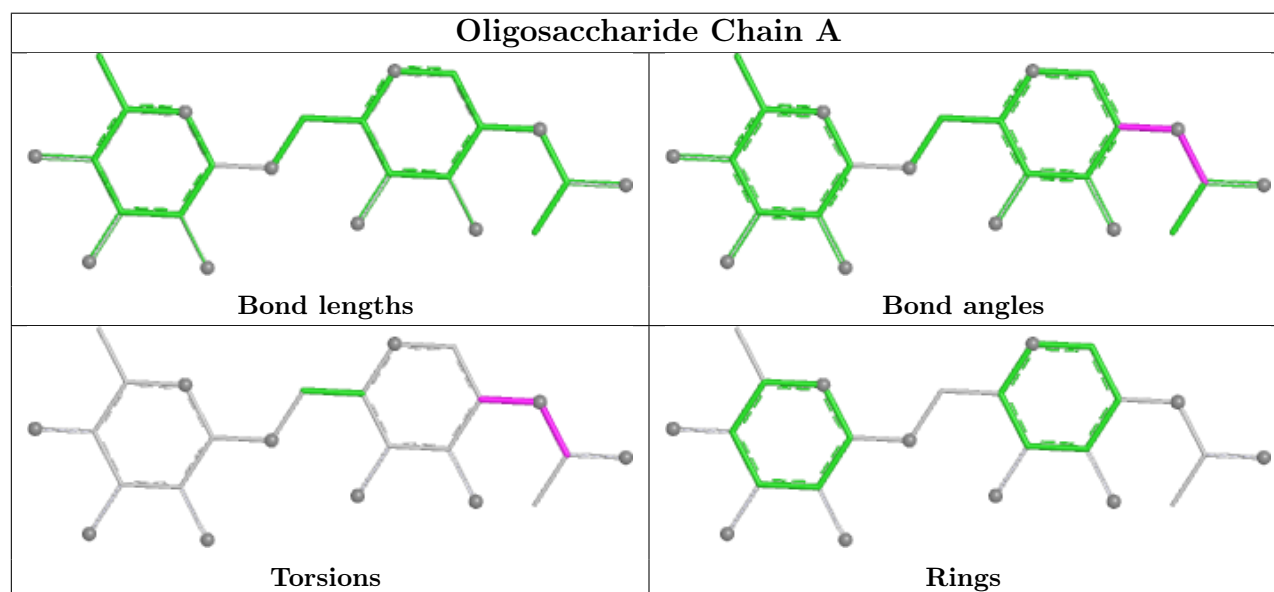
All (1) ring outliers are listed below:

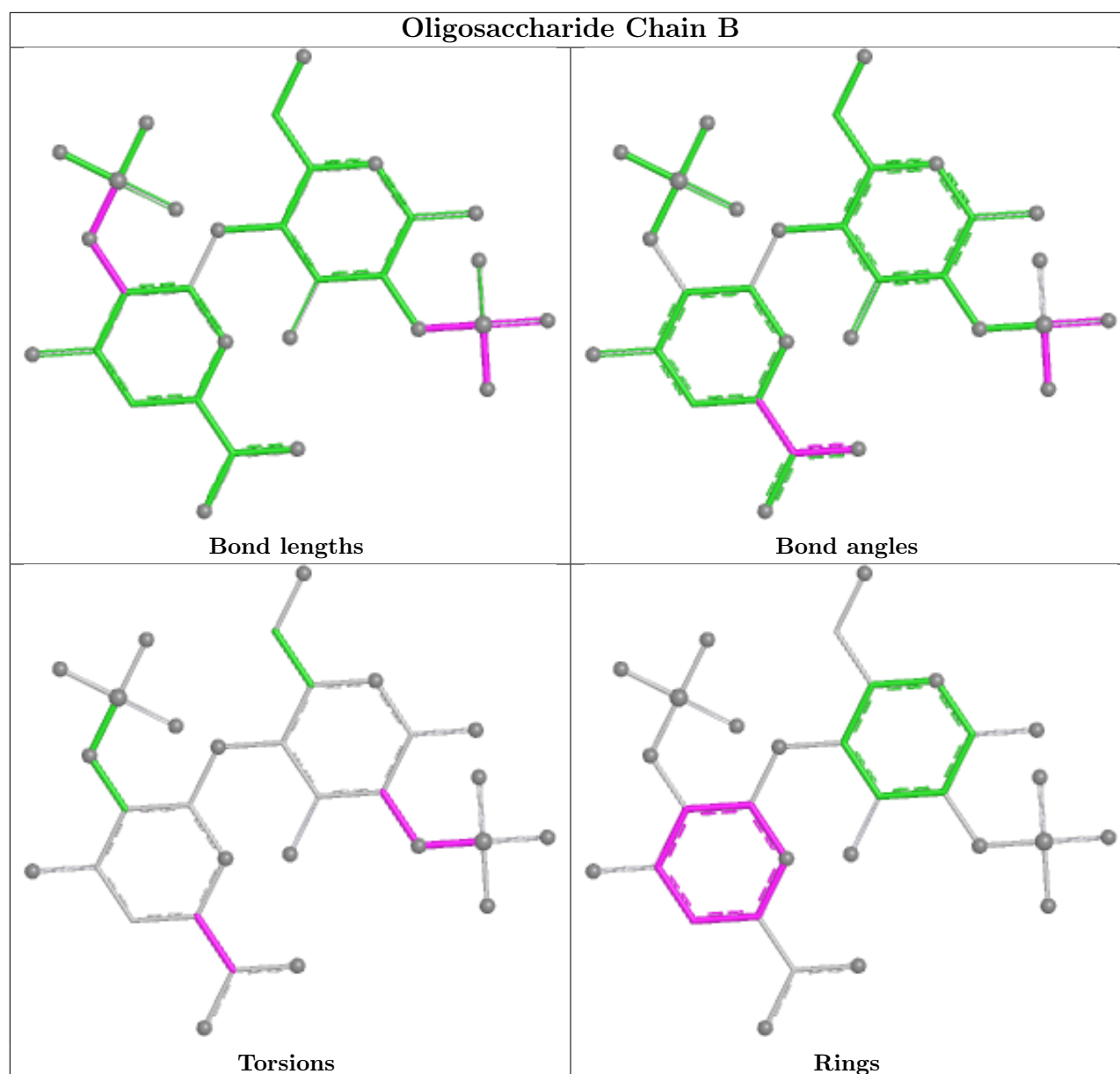
Mol	Chain	Res	Type	Atoms
5	B	2	IDS	C1-C2-C3-C4-C5-O5

3 monomers are involved in 8 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	A	1	NAG	1	0
5	B	1	SGN	4	0
5	B	2	IDS	3	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](#)

8 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
6	SO4	I	388	-	4,4,4	0.37	0	6,6,6	0.08	0
6	SO4	I	389	-	4,4,4	0.37	0	6,6,6	0.07	0
7	GOL	H	3	-	5,5,5	0.32	0	5,5,5	0.31	0
7	GOL	H	782	-	5,5,5	0.33	0	5,5,5	0.17	0
6	SO4	H	781	-	4,4,4	0.37	0	6,6,6	0.09	0
7	GOL	I	390	-	5,5,5	0.32	0	5,5,5	0.31	0
7	GOL	H	4	-	5,5,5	0.33	0	5,5,5	0.27	0
7	GOL	I	391	-	5,5,5	0.33	0	5,5,5	0.31	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
7	GOL	H	3	-	-	0/4/4/4	-
7	GOL	H	782	-	-	0/4/4/4	-
7	GOL	I	390	-	-	0/4/4/4	-
7	GOL	H	4	-	-	0/4/4/4	-
7	GOL	I	391	-	-	0/4/4/4	-

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.

3 monomers are involved in 8 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
7	I	390	GOL	6	0
7	H	4	GOL	1	0
7	I	391	GOL	1	0

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, 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	L	44/49 (89%)	-0.03	2 (4%) 38 40	6, 17, 28, 45	2 (4%)
2	H	253/259 (97%)	0.19	27 (10%) 11 11	4, 16, 32, 53	34 (13%)
3	I	355/395 (89%)	1.47	85 (23%) 2 1	8, 37, 59, 69	9 (2%)
All	All	652/703 (92%)	0.87	114 (17%) 4 3	4, 27, 54, 69	45 (6%)

All (114) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	H	186[A]	PRO	6.5
2	H	186(C)[A]	GLY	6.1
3	I	345	ALA	6.0
3	I	337[A]	ASP	5.2
3	I	343	ALA	5.0
3	I	344	ALA	4.6
3	I	40	ALA	4.5
3	I	226[A]	LEU	4.5
3	I	106	PHE	4.4
2	H	149[A]	LYS	4.2
3	I	322	ASN	4.1
2	H	150[A]	GLY	4.1
3	I	110	LEU	4.0
2	H	36(A)	SER	3.8
3	I	105	GLY	3.8
3	I	211	VAL	3.7
2	H	37	PRO	3.7
3	I	102	PRO	3.7
3	I	108	LEU	3.6
3	I	200	GLN	3.6
3	I	194	PHE	3.5
3	I	199	THR	3.5
2	H	185[A]	LYS	3.3

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Mol	Chain	Res	Type	RSRZ
3	I	104	ASP	3.3
3	I	83	SER	3.3
3	I	242	GLY	3.3
3	I	204	PHE	3.3
3	I	158	ALA	3.2
2	H	186(B)[A]	GLU	3.2
3	I	77	GLY	3.2
3	I	196	HIS	3.2
2	H	82[A]	ILE	3.1
3	I	348	GLY	3.1
2	H	65	LEU	3.1
3	I	214	VAL	3.0
3	I	99	LEU	3.0
3	I	78	LEU	3.0
2	H	73[A]	ARG	3.0
3	I	103	ARG	3.0
3	I	183	TYR	2.9
3	I	96	LEU	2.9
2	H	186(A)[A]	ASP	2.9
2	H	147	THR	2.9
3	I	195	ASN	2.9
2	H	36	LYS	2.9
2	H	78[A]	ASN	2.9
3	I	341	THR	2.8
3	I	205	TYR	2.8
3	I	172	LEU	2.8
3	I	278[A]	ARG	2.8
3	I	202	GLN	2.8
3	I	192	THR	2.8
2	H	41[A]	LEU	2.8
3	I	114	LEU	2.8
2	H	153[A]	SER	2.8
3	I	198	GLY	2.8
3	I	100	ASN	2.7
1	L	14(L)	ASP	2.7
3	I	272	LEU	2.7
3	I	212	VAL	2.7
3	I	364	VAL	2.7
3	I	303	GLY	2.7
2	H	75[A]	ARG	2.6
3	I	362	ARG	2.6
3	I	28	ASP	2.6

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Mol	Chain	Res	Type	RSRZ
3	I	375	ASP	2.6
3	I	95	LEU	2.5
3	I	73	LEU	2.5
3	I	36	ALA	2.5
3	I	347	THR	2.5
3	I	359	ASN	2.5
3	I	376	ASN	2.4
2	H	38	GLN	2.4
3	I	130[A]	MET	2.4
3	I	76	LEU	2.4
2	H	34	PHE	2.4
3	I	157	VAL	2.4
2	H	35	ARG	2.4
3	I	275	PHE	2.4
3	I	107	GLN	2.3
3	I	243	ASN	2.3
2	H	40[A]	LEU	2.3
3	I	168	LEU	2.3
3	I	302	LEU	2.3
3	I	216[A]	MET	2.3
3	I	88	LEU	2.3
3	I	358	LEU	2.3
1	L	1(Q)	GLU	2.3
3	I	163	GLY	2.3
3	I	203	ASP	2.3
3	I	323	ILE	2.3
3	I	340	GLY	2.3
3	I	188	ALA	2.2
3	I	193	SER	2.2
3	I	218	SER	2.2
2	H	244[A]	GLN	2.2
2	H	222[A]	ASP	2.2
2	H	186(D)[A]	LYS	2.2
3	I	201	GLU	2.2
3	I	92	PHE	2.2
3	I	109	SER	2.2
3	I	360	SER	2.2
3	I	173	ASP	2.1
3	I	227	LEU	2.1
3	I	207	THR	2.1
3	I	283	TYR	2.1
3	I	171	ASN	2.0

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Mol	Chain	Res	Type	RSRZ
3	I	208	SER	2.0
3	I	169	LEU	2.0
3	I	215	PRO	2.0
2	H	84[A]	MET	2.0
2	H	243[A]	ASP	2.0
3	I	298	VAL	2.0
3	I	273	LYS	2.0

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

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

6.3 Carbohydrates [i](#)

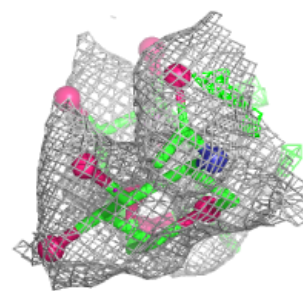
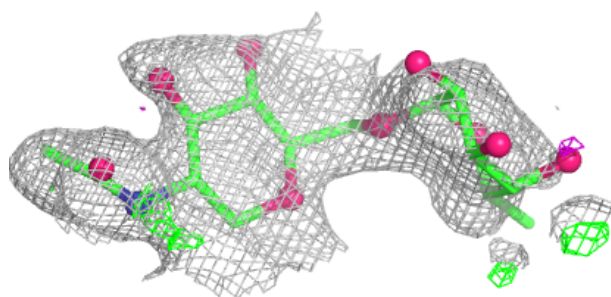
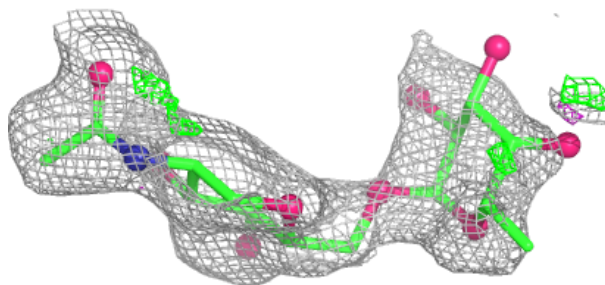
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

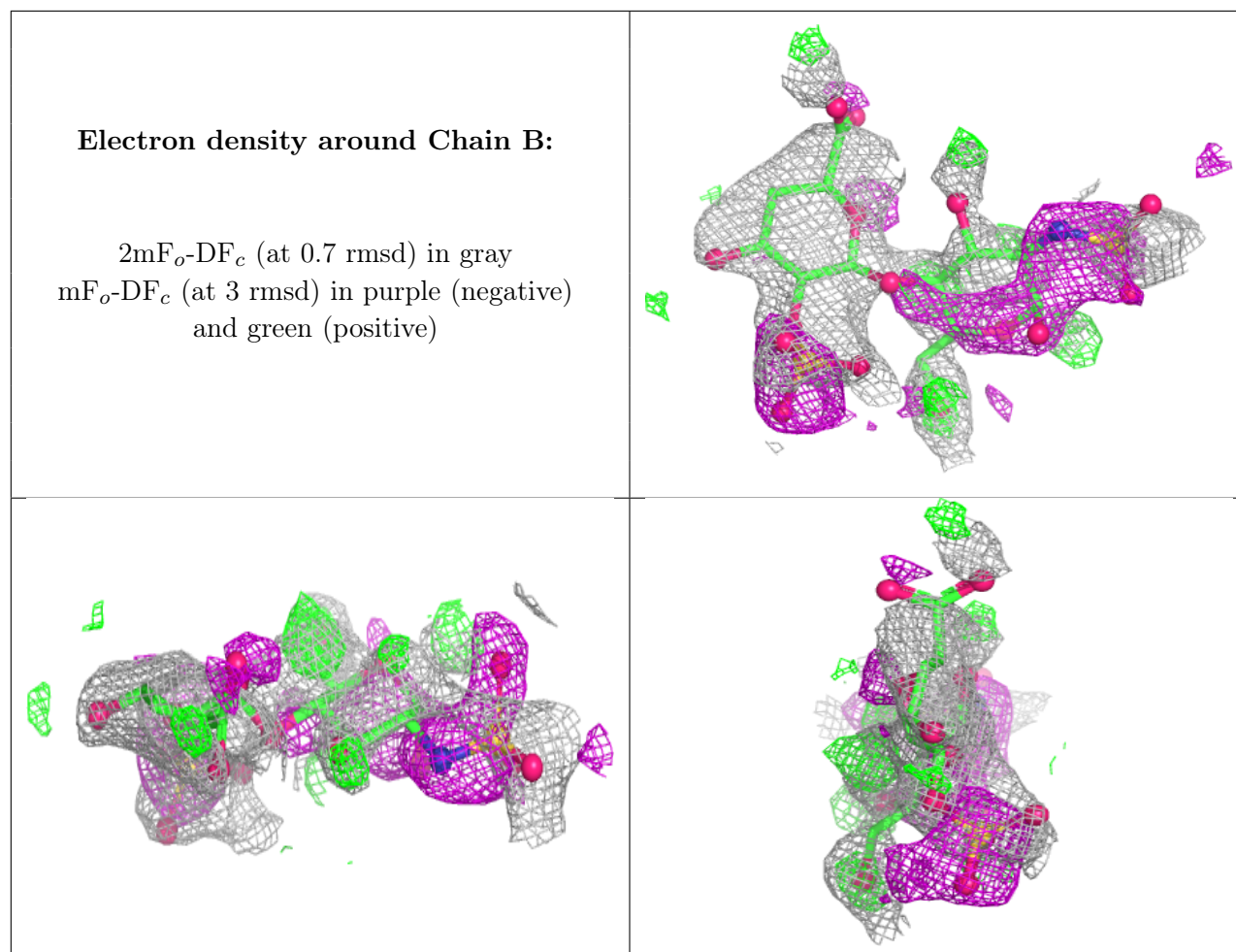
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
4	NAG	A	1	14/15	-	-	50,54,59,63	0
4	FUC	A	2	10/11	-	-	66,68,68,69	0
5	SGN	B	1	16/20	-	-	65,72,76,76	0
5	IDS	B	2	15/17	-	-	71,72,76,76	0

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 A:

$2mF_o - DF_c$ (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
7	GOL	I	391	6/6	0.65	0.15	60,60,61,61	0
6	SO4	H	781	5/5	0.72	0.19	77,77,77,77	3
7	GOL	H	4	6/6	0.75	0.19	55,55,55,55	2
6	SO4	I	389	5/5	0.76	0.13	76,76,76,76	2
7	GOL	I	390	6/6	0.81	0.14	44,45,45,46	2
7	GOL	H	3	6/6	0.82	0.23	48,49,49,50	3
6	SO4	I	388	5/5	0.89	0.13	70,70,70,71	3
7	GOL	H	782	6/6	0.91	0.12	20,24,25,27	3

6.5 Other polymers [i](#)

There are no such residues in this entry.