



# Full wwPDB X-ray Structure Validation Report ⓘ

Jan 2, 2024 – 11:24 pm GMT

PDB ID : 5F7Y  
Title : Blood group antigen binding adhesin BabA of Helicobacter pylori strain 17875 in complex with blood group A type-1 hexasaccharide  
Authors : Moonens, K.; Gideonsson, P.; Subedi, S.; Romao, E.; Oscarson, S.; Muylder-mans, S.; Boren, T.; Remaut, H.  
Deposited on : 2015-12-08  
Resolution : 2.44 Å(reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

We welcome your comments at [validation@mail.wwpdb.org](mailto:validation@mail.wwpdb.org)

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

---

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

MolProbity : 4.02b-467  
Mogul : 1.8.4, CSD as541be (2020)  
Xtriage (Phenix) : 1.13  
EDS : 2.36  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
Refmac : 5.8.0158  
CCP4 : 7.0.044 (Gargrove)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.36

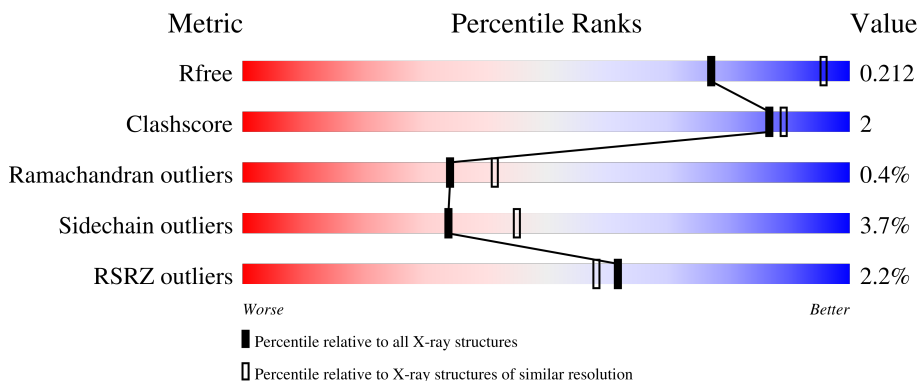
# 1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.44 Å.

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



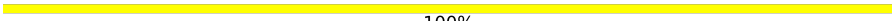
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
$R_{free}$	130704	1564 (2.46-2.42)
Clashscore	141614	1631 (2.46-2.42)
Ramachandran outliers	138981	1617 (2.46-2.42)
Sidechain outliers	138945	1617 (2.46-2.42)
RSRZ outliers	127900	1547 (2.46-2.42)

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

Mol	Chain	Length	Quality of chain
1	A	466	 3% 83% 6% 11%
2	B	466	 2% 84% 6% 10%
3	C	120	 % 87% 8% • 5%
3	D	120	 % 89% 5% • 5%
4	E	6	 17% 83%

Continued on next page...

*Continued from previous page...*

Mol	Chain	Length	Quality of chain
4	F	6	 100%

## 2 Entry composition i

There are 5 unique types of molecules in this entry. The entry contains 8260 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 Adhesin binding fucosylated histo-blood group antigen.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	417	3109	1917	537	642	13	0	1	0

There are 31 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	3	ALA	-	expression tag	UNP O52269
A	4	SER	-	expression tag	UNP O52269
A	5	TRP	-	expression tag	UNP O52269
A	6	SER	-	expression tag	UNP O52269
A	7	HIS	-	expression tag	UNP O52269
A	8	PRO	-	expression tag	UNP O52269
A	9	GLN	-	expression tag	UNP O52269
A	10	PHE	-	expression tag	UNP O52269
A	11	GLU	-	expression tag	UNP O52269
A	12	LYS	-	expression tag	UNP O52269
A	13	SER	-	expression tag	UNP O52269
A	14	GLY	-	expression tag	UNP O52269
A	15	GLY	-	expression tag	UNP O52269
A	16	GLY	-	expression tag	UNP O52269
A	17	GLY	-	expression tag	UNP O52269
A	18	GLY	-	expression tag	UNP O52269
A	19	LEU	-	expression tag	UNP O52269
A	20	VAL	-	expression tag	UNP O52269
A	21	PRO	-	expression tag	UNP O52269
A	22	ARG	-	expression tag	UNP O52269
A	23	GLY	-	expression tag	UNP O52269
A	24	SER	-	expression tag	UNP O52269
A	226	LYS	THR	conflict	UNP O52269
A	461	GLY	-	expression tag	UNP O52269
A	462	SER	-	expression tag	UNP O52269
A	463	HIS	-	expression tag	UNP O52269
A	464	HIS	-	expression tag	UNP O52269

*Continued on next page...*

*Continued from previous page...*

Chain	Residue	Modelled	Actual	Comment	Reference
A	465	HIS	-	expression tag	UNP O52269
A	466	HIS	-	expression tag	UNP O52269
A	467	HIS	-	expression tag	UNP O52269
A	468	HIS	-	expression tag	UNP O52269

- Molecule 2 is a protein called Adhesin binding fucosylated histo-blood group antigen.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	420	3124	1926	540	645	13	0	0	0

There are 30 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	3	ALA	-	expression tag	UNP O52269
B	4	SER	-	expression tag	UNP O52269
B	5	TRP	-	expression tag	UNP O52269
B	6	SER	-	expression tag	UNP O52269
B	7	HIS	-	expression tag	UNP O52269
B	8	PRO	-	expression tag	UNP O52269
B	9	GLN	-	expression tag	UNP O52269
B	10	PHE	-	expression tag	UNP O52269
B	11	GLU	-	expression tag	UNP O52269
B	12	LYS	-	expression tag	UNP O52269
B	13	SER	-	expression tag	UNP O52269
B	14	GLY	-	expression tag	UNP O52269
B	15	GLY	-	expression tag	UNP O52269
B	16	GLY	-	expression tag	UNP O52269
B	17	GLY	-	expression tag	UNP O52269
B	18	GLY	-	expression tag	UNP O52269
B	19	LEU	-	expression tag	UNP O52269
B	20	VAL	-	expression tag	UNP O52269
B	21	PRO	-	expression tag	UNP O52269
B	22	ARG	-	expression tag	UNP O52269
B	23	GLY	-	expression tag	UNP O52269
B	24	SER	-	expression tag	UNP O52269
B	461	GLY	-	expression tag	UNP O52269
B	462	SER	-	expression tag	UNP O52269
B	463	HIS	-	expression tag	UNP O52269
B	464	HIS	-	expression tag	UNP O52269
B	465	HIS	-	expression tag	UNP O52269
B	466	HIS	-	expression tag	UNP O52269

*Continued on next page...*

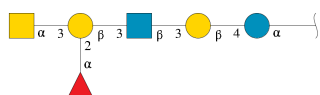
Continued from previous page...

Chain	Residue	Modelled	Actual	Comment	Reference
B	467	HIS	-	expression tag	UNP O52269
B	468	HIS	-	expression tag	UNP O52269

- Molecule 3 is a protein called Nanobody Nb-ER19.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	C	114	Total	C	N	O	S	0	0	0
			873	546	158	164	5			
3	D	114	Total	C	N	O	S	0	0	0
			873	546	158	164	5			

- Molecule 4 is an oligosaccharide called alpha-L-fucopyranose-(1-2)-[2-acetamido-2-deoxy-alpha-D-galactopyranose-(1-3)]beta-D-galactopyranose-(1-3)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-3)-beta-D-galactopyranose-(1-4)-alpha-D-glucopyranose.



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
4	E	6	Total	C	N	O	0	0	0
			72	40	2	30			
4	F	6	Total	C	N	O	0	0	0
			72	40	2	30			

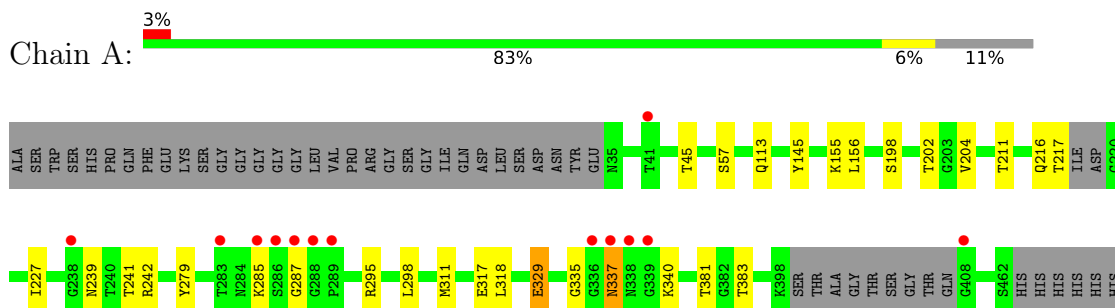
- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	52	Total	O	0	0
			52	52		
5	B	37	Total	O	0	0
			37	37		
5	C	15	Total	O	0	0
			15	15		
5	D	33	Total	O	0	0
			33	33		

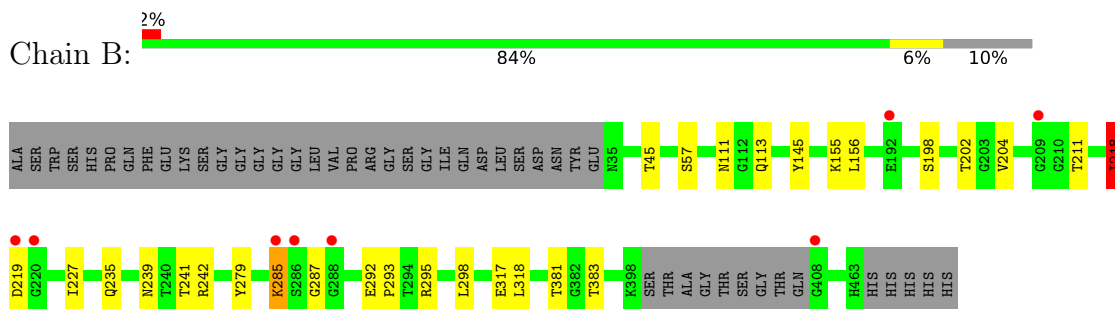
### 3 Residue-property plots [i](#)

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.

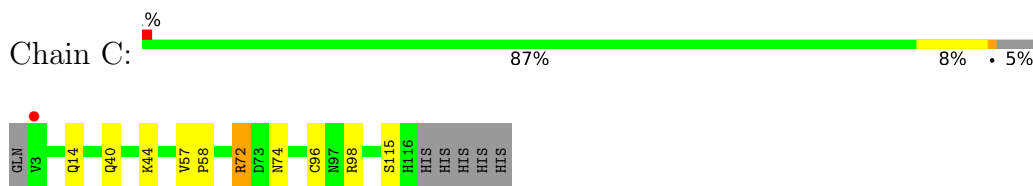
- Molecule 1: Adhesin binding fucosylated histo-blood group antigen



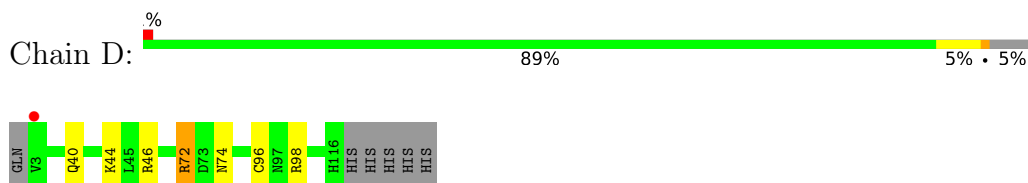
- Molecule 2: Adhesin binding fucosylated histo-blood group antigen



- Molecule 3: Nanobody Nb-ER19



- Molecule 3: Nanobody Nb-ER19



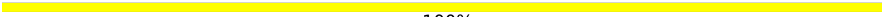
- Molecule 4: alpha-L-fucopyranose-(1-2)-[2-acetamido-2-deoxy-alpha-D-galactopyranose-(1-3)]beta-D-galactopyranose-(1-3)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-3)-beta-D-galactopyra

nose-(1-4)-alpha-D-glucopyranose

Chain E:  17% 83%

GLC1  
GAL2  
MAG3  
GAL4  
FUC5  
A2G6

• Molecule 4: alpha-L-fucopyranose-(1-2)-[2-acetamido-2-deoxy-alpha-D-galactopyranose-(1-3)]beta-D-galactopyranose-(1-3)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-3)-beta-D-galactopyranose-(1-4)-alpha-D-glucopyranose

Chain F:  100%

GLC1  
GAL2  
MAG3  
GAL4  
FUC5  
A2G6



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	50.87Å 131.71Å 123.61Å 90.00° 94.69° 90.00°	Depositor
Resolution (Å)	34.90 – 2.44 34.85 – 2.44	Depositor EDS
% Data completeness (in resolution range)	99.5 (34.90-2.44) 99.6 (34.85-2.44)	Depositor EDS
$R_{merge}$	0.10	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.12 (at 2.45Å)	Xtrriage
Refinement program	REFMAC 5.8.0049	Depositor
R, $R_{free}$	0.176 , 0.205 0.183 , 0.212	Depositor DCC
$R_{free}$ test set	3012 reflections (5.01%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	50.4	Xtrriage
Anisotropy	0.087	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.31 , 32.3	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.47$ , $\langle L^2 \rangle = 0.30$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.96	EDS
Total number of atoms	8260	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	58.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.39% of the height of the origin peak. No significant pseudotranslation is detected.*

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

<sup>2</sup>Theoretical values of  $\langle |L| \rangle$ ,  $\langle L^2 \rangle$  for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

## 5 Model quality i

### 5.1 Standard geometry i

Bond lengths and bond angles in the following residue types are not validated in this section: GLC, FUC, NAG, A2G, GAL

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	0.83	0/3154	0.82	3/4283 (0.1%)
2	B	0.80	1/3171 (0.0%)	0.79	0/4310
3	C	0.91	0/893	0.99	3/1210 (0.2%)
3	D	0.98	0/893	1.02	4/1210 (0.3%)
All	All	0.84	1/8111 (0.0%)	0.85	10/11013 (0.1%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	317	GLU	CG-CD	5.46	1.60	1.51

All (10) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	C	72	ARG	NE-CZ-NH2	-10.26	115.17	120.30
3	D	72	ARG	NE-CZ-NH1	9.92	125.26	120.30
3	C	72	ARG	NE-CZ-NH1	9.10	124.85	120.30
3	D	72	ARG	NE-CZ-NH2	-8.86	115.87	120.30
3	C	98	ARG	NE-CZ-NH1	6.93	123.77	120.30
3	D	98	ARG	NE-CZ-NH1	6.70	123.65	120.30
3	D	46	ARG	NE-CZ-NH2	-6.06	117.27	120.30
1	A	317[A]	GLU	CA-CB-CG	5.35	125.16	113.40
1	A	317[B]	GLU	CA-CB-CG	5.35	125.16	113.40
1	A	311	MET	CG-SD-CE	-5.01	92.18	100.20

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	3109	0	3039	15	0
2	B	3124	0	3051	14	0
3	C	873	0	852	2	0
3	D	873	0	852	1	0
4	E	72	0	62	0	0
4	F	72	0	62	0	0
5	A	52	0	0	0	0
5	B	37	0	0	1	0
5	C	15	0	0	0	0
5	D	33	0	0	0	0
All	All	8260	0	7918	32	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 2.

All (32) 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:B:292:GLU:OE2	2:B:293:PRO:HA	1.93	0.68
1:A:198:SER:O	1:A:202:THR:HB	1.98	0.64
2:B:198:SER:O	2:B:202:THR:HB	1.99	0.62
1:A:216:GLN:HG3	1:A:217:THR:N	2.15	0.61
2:B:241:THR:O	2:B:242:ARG:HB2	2.03	0.59
1:A:279:TYR:OH	1:A:295:ARG:HD2	2.06	0.55
2:B:218:ILE:HG22	2:B:219:ASP:N	2.23	0.53
3:C:72:ARG:HD3	3:C:74:ASN:OD1	2.10	0.51
1:A:318:LEU:C	1:A:318:LEU:HD23	2.32	0.50
1:A:329:GLU:O	1:A:329:GLU:HG2	2.11	0.49
3:D:72:ARG:HD3	3:D:74:ASN:OD1	2.12	0.49
2:B:285:LYS:HG3	5:B:637:HOH:O	2.13	0.47
2:B:318:LEU:C	2:B:318:LEU:HD23	2.35	0.46
1:A:279:TYR:OH	1:A:295:ARG:HG2	2.16	0.46
2:B:204:VAL:O	2:B:204:VAL:HG13	2.15	0.46
2:B:279:TYR:OH	2:B:295:ARG:HG2	2.16	0.45
1:A:155:LYS:HE3	1:A:155:LYS:HB2	1.78	0.44

*Continued on next page...*

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:298:LEU:HD12	1:A:298:LEU:HA	1.87	0.44
1:A:202:THR:HG22	1:A:204:VAL:H	1.82	0.44
2:B:298:LEU:HD12	2:B:298:LEU:HA	1.90	0.44
2:B:155:LYS:HE3	2:B:155:LYS:HB2	1.77	0.43
2:B:156:LEU:C	2:B:156:LEU:HD23	2.40	0.42
1:A:202:THR:HG22	1:A:204:VAL:HG23	2.01	0.42
1:A:156:LEU:C	1:A:156:LEU:HD23	2.41	0.42
1:A:202:THR:CG2	1:A:204:VAL:HG23	2.50	0.41
3:C:57:VAL:HA	3:C:58:PRO:HD3	1.94	0.41
1:A:279:TYR:OH	1:A:295:ARG:CG	2.69	0.41
2:B:239:ASN:OD1	2:B:241:THR:CG2	2.67	0.41
1:A:239:ASN:OD1	1:A:241:THR:CG2	2.69	0.41
1:A:337:ASN:O	1:A:340:LYS:HB3	2.21	0.40
2:B:204:VAL:O	2:B:204:VAL:CG1	2.69	0.40
2:B:239:ASN:OD1	2:B:241:THR:HG23	2.21	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	412/466 (88%)	397 (96%)	13 (3%)	2 (0%)	29 34
2	B	416/466 (89%)	398 (96%)	16 (4%)	2 (0%)	29 34
3	C	112/120 (93%)	111 (99%)	1 (1%)	0	100 100
3	D	112/120 (93%)	111 (99%)	1 (1%)	0	100 100
All	All	1052/1172 (90%)	1017 (97%)	31 (3%)	4 (0%)	34 41

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	B	218	ILE
1	A	335	GLY
2	B	287	GLY
1	A	287	GLY

### 5.3.2 Protein sidechains [i](#)

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	344/381 (90%)	332 (96%)	12 (4%)	36	47
2	B	346/381 (91%)	334 (96%)	12 (4%)	36	47
3	C	93/99 (94%)	88 (95%)	5 (5%)	22	29
3	D	93/99 (94%)	90 (97%)	3 (3%)	39	50
All	All	876/960 (91%)	844 (96%)	32 (4%)	34	45

All (32) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	45	THR
1	A	57	SER
1	A	113	GLN
1	A	145	TYR
1	A	211	THR
1	A	227	ILE
1	A	242	ARG
1	A	285	LYS
1	A	329	GLU
1	A	337	ASN
1	A	381	THR
1	A	383	THR
2	B	45	THR
2	B	57	SER
2	B	111	ASN
2	B	113	GLN
2	B	145	TYR
2	B	211	THR

*Continued on next page...*

*Continued from previous page...*

Mol	Chain	Res	Type
2	B	218	ILE
2	B	227	ILE
2	B	235	GLN
2	B	285	LYS
2	B	381	THR
2	B	383	THR
3	C	14	GLN
3	C	40	GLN
3	C	44	LYS
3	C	96	CYS
3	C	115	SER
3	D	40	GLN
3	D	44	LYS
3	D	96	CYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	168	ASN
1	A	366	ASN

### 5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

## 5.5 Carbohydrates [i](#)

12 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	GLC	E	1	4	12,12,12	0.46	0	17,17,17	0.53	0
4	GAL	E	2	4	11,11,12	0.83	0	15,15,17	1.53	3 (20%)
4	NAG	E	3	4	14,14,15	0.86	1 (7%)	17,19,21	2.05	3 (17%)
4	GAL	E	4	4	11,11,12	0.76	0	15,15,17	1.66	5 (33%)
4	FUC	E	5	4	10,10,11	0.89	0	14,14,16	1.43	4 (28%)
4	A2G	E	6	4	14,14,15	0.38	0	17,19,21	1.51	1 (5%)
4	GLC	F	1	4	12,12,12	0.59	0	17,17,17	1.24	3 (17%)
4	GAL	F	2	4	11,11,12	0.64	0	15,15,17	1.80	5 (33%)
4	NAG	F	3	4	14,14,15	0.74	0	17,19,21	1.26	2 (11%)
4	GAL	F	4	4	11,11,12	0.94	1 (9%)	15,15,17	1.36	2 (13%)
4	FUC	F	5	4	10,10,11	0.77	0	14,14,16	1.14	1 (7%)
4	A2G	F	6	4	14,14,15	0.45	0	17,19,21	0.97	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
4	GLC	E	1	4	-	2/2/22/22	0/1/1/1
4	GAL	E	2	4	-	2/2/19/22	0/1/1/1
4	NAG	E	3	4	-	0/6/23/26	0/1/1/1
4	GAL	E	4	4	-	0/2/19/22	0/1/1/1
4	FUC	E	5	4	-	-	0/1/1/1
4	A2G	E	6	4	-	0/6/23/26	0/1/1/1
4	GLC	F	1	4	-	0/2/22/22	0/1/1/1
4	GAL	F	2	4	-	2/2/19/22	0/1/1/1
4	NAG	F	3	4	-	0/6/23/26	0/1/1/1
4	GAL	F	4	4	-	2/2/19/22	0/1/1/1
4	FUC	F	5	4	-	-	0/1/1/1
4	A2G	F	6	4	-	0/6/23/26	0/1/1/1

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	E	3	NAG	O5-C1	-2.40	1.39	1.43
4	F	4	GAL	O5-C1	-2.28	1.40	1.43

All (30) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	E	3	NAG	C1-O5-C5	6.29	120.71	112.19
4	E	6	A2G	C1-O5-C5	5.05	119.04	112.19
4	F	2	GAL	C1-C2-C3	3.83	114.37	109.67
4	F	4	GAL	C1-C2-C3	3.59	114.08	109.67
4	E	4	GAL	C1-O5-C5	3.40	116.81	112.19
4	F	5	FUC	O2-C2-C3	-3.11	103.91	110.14
4	E	2	GAL	C1-C2-C3	3.01	113.36	109.67
4	F	2	GAL	O2-C2-C3	-2.89	104.35	110.14
4	E	4	GAL	O5-C1-C2	2.84	115.16	110.77
4	E	3	NAG	O7-C7-C8	-2.69	117.06	122.06
4	E	2	GAL	C2-C3-C4	-2.69	106.25	110.89
4	E	4	GAL	O5-C5-C6	2.45	111.05	107.20
4	F	3	NAG	O7-C7-N2	2.42	126.41	121.95
4	F	4	GAL	O4-C4-C5	2.37	115.19	109.30
4	F	2	GAL	C1-O5-C5	2.37	115.40	112.19
4	E	5	FUC	O2-C2-C1	2.37	113.99	109.15
4	F	3	NAG	O5-C5-C6	2.30	110.81	107.20
4	E	5	FUC	C2-C3-C4	-2.25	107.01	110.89
4	E	5	FUC	O2-C2-C3	-2.20	105.73	110.14
4	F	1	GLC	C4-C3-C2	-2.19	107.01	110.82
4	E	3	NAG	C1-C2-N2	2.18	114.22	110.49
4	F	1	GLC	O5-C1-C2	2.17	114.16	110.28
4	F	1	GLC	O4-C4-C5	2.13	114.58	109.30
4	F	6	A2G	O3-C3-C4	2.12	115.25	110.35
4	F	2	GAL	O3-C3-C2	-2.11	105.96	109.99
4	E	4	GAL	O3-C3-C2	-2.09	105.98	109.99
4	E	2	GAL	O5-C5-C6	2.09	110.47	107.20
4	E	4	GAL	C1-C2-C3	2.02	112.14	109.67
4	E	5	FUC	O4-C4-C3	-2.01	105.70	110.35
4	F	2	GAL	O5-C5-C6	2.01	110.36	107.20

There are no chirality outliers.

All (8) torsion outliers are listed below:

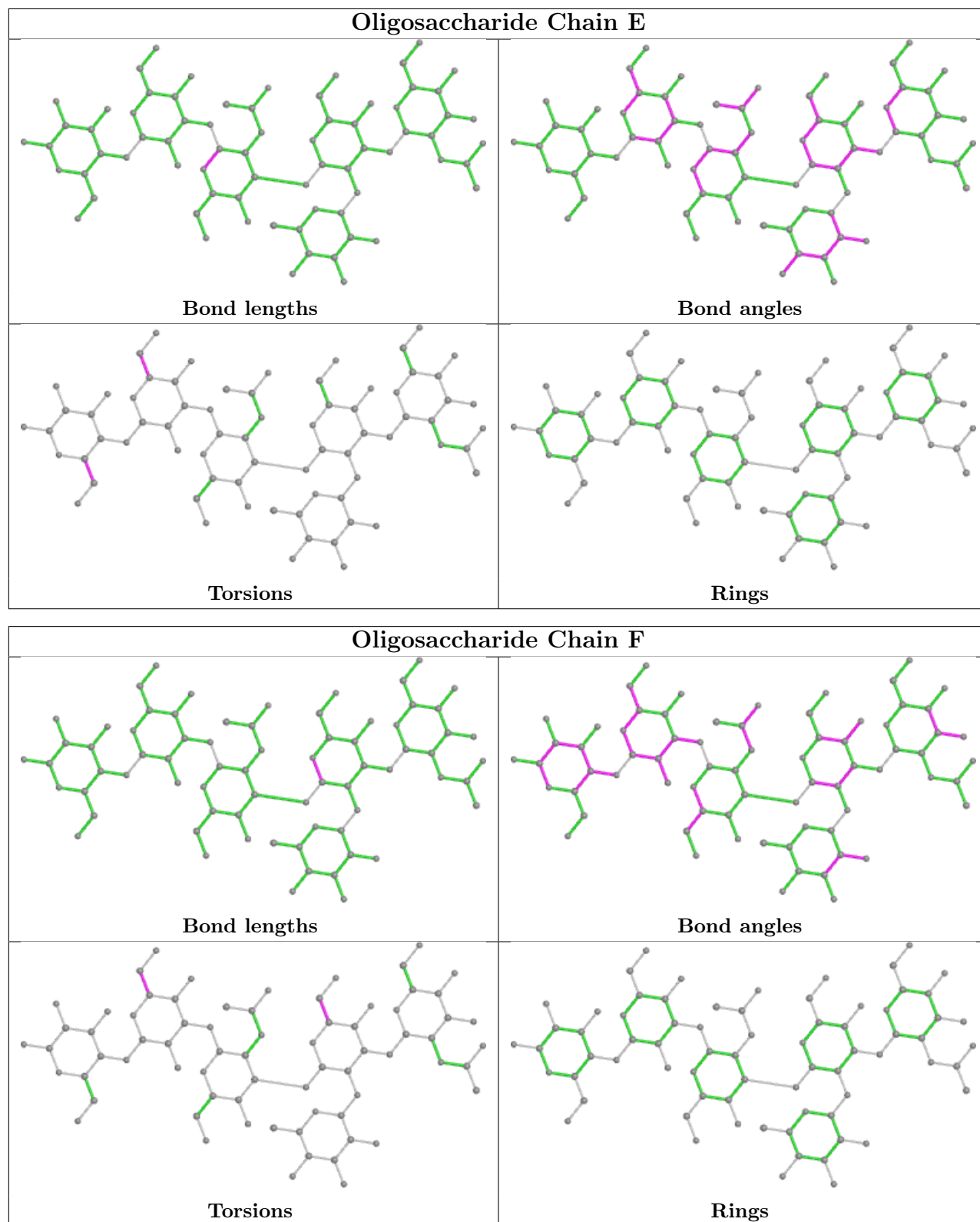
Mol	Chain	Res	Type	Atoms
4	E	1	GLC	O5-C5-C6-O6
4	E	2	GAL	O5-C5-C6-O6
4	E	1	GLC	C4-C5-C6-O6
4	E	2	GAL	C4-C5-C6-O6
4	F	2	GAL	C4-C5-C6-O6
4	F	4	GAL	O5-C5-C6-O6
4	F	2	GAL	O5-C5-C6-O6
4	F	4	GAL	C4-C5-C6-O6



There are no ring outliers.

No monomer is involved in short contacts.

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



## 5.6 Ligand geometry [i](#)

There are no ligands in this entry.

## 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, 95<sup>th</sup> percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q < 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å <sup>2</sup> )	Q<0.9
1	A	417/466 (89%)	-0.22	13 (3%) 49 45	35, 52, 101, 124	0
2	B	420/466 (90%)	-0.16	8 (1%) 66 63	35, 56, 112, 141	0
3	C	114/120 (95%)	-0.38	1 (0%) 84 83	38, 52, 74, 120	0
3	D	114/120 (95%)	-0.57	1 (0%) 84 83	31, 44, 66, 93	0
All	All	1065/1172 (90%)	-0.25	23 (2%) 62 58	31, 53, 103, 141	0

All (23) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
3	C	3	VAL	5.9
1	A	41	THR	5.3
2	B	220	GLY	4.0
1	A	287	GLY	3.9
1	A	286	SER	3.8
1	A	338	ASN	3.7
2	B	219	ASP	3.4
1	A	336	GLY	2.8
2	B	286	SER	2.8
1	A	288	GLY	2.7
1	A	339	GLY	2.7
1	A	289	PRO	2.6
2	B	192	GLU	2.6
1	A	285	LYS	2.4
2	B	209	GLY	2.3
1	A	283	THR	2.3
1	A	408	GLY	2.2
2	B	408	GLY	2.2
3	D	3	VAL	2.2
2	B	288	GLY	2.1
1	A	337	ASN	2.1

*Continued on next page...*

*Continued from previous page...*

Mol	Chain	Res	Type	RSRZ
1	A	238	GLY	2.0
2	B	285	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](#)

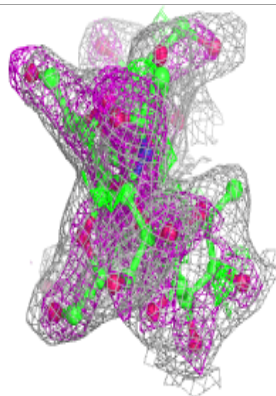
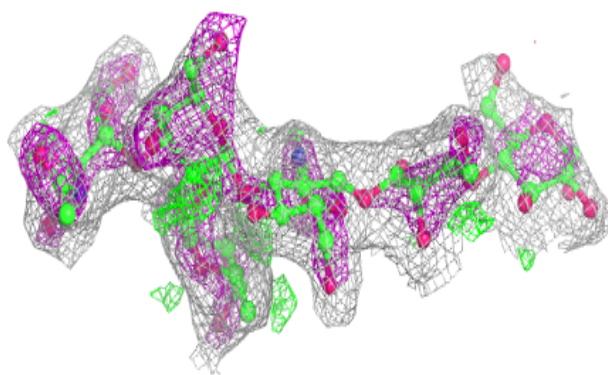
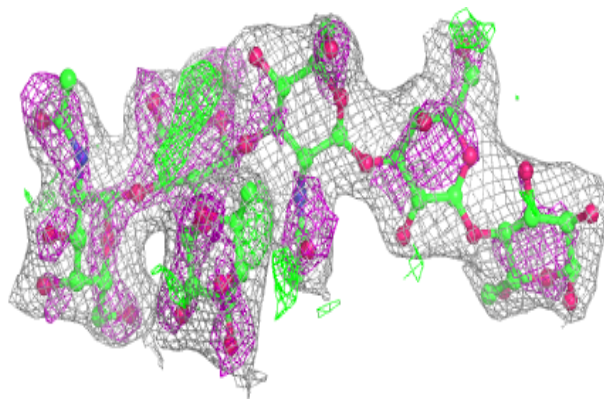
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95<sup>th</sup> percentile and maximum values of B factors of atoms in the group. The column labelled 'Q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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å <sup>2</sup> )	Q<0.9
4	GLC	E	1	12/12	0.76	0.36	74,86,93,95	0
4	GAL	F	4	11/12	0.80	0.30	35,39,41,41	0
4	GLC	F	1	12/12	0.84	0.34	70,77,83,84	0
4	A2G	F	6	14/15	0.86	0.29	43,47,53,56	0
4	GAL	F	2	11/12	0.88	0.27	48,56,61,62	0
4	GAL	E	2	11/12	0.91	0.26	43,54,59,60	0
4	NAG	F	3	14/15	0.91	0.30	39,43,45,45	0
4	A2G	E	6	14/15	0.92	0.21	32,37,45,46	0
4	FUC	F	5	10/11	0.93	0.23	32,36,39,40	0
4	GAL	E	4	11/12	0.94	0.23	30,35,38,43	0
4	FUC	E	5	10/11	0.95	0.17	27,30,31,31	0
4	NAG	E	3	14/15	0.95	0.27	38,43,47,52	0

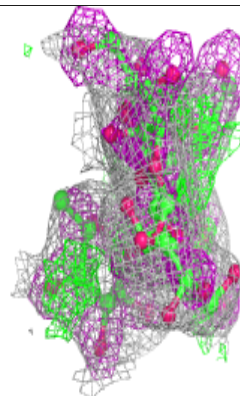
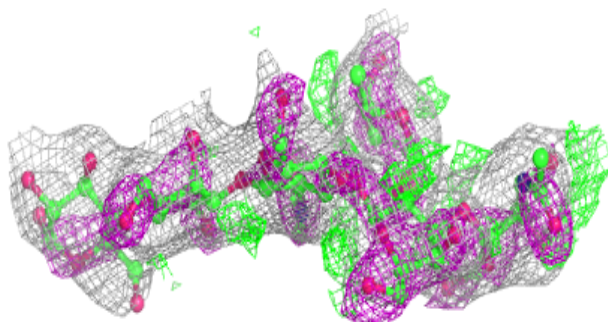
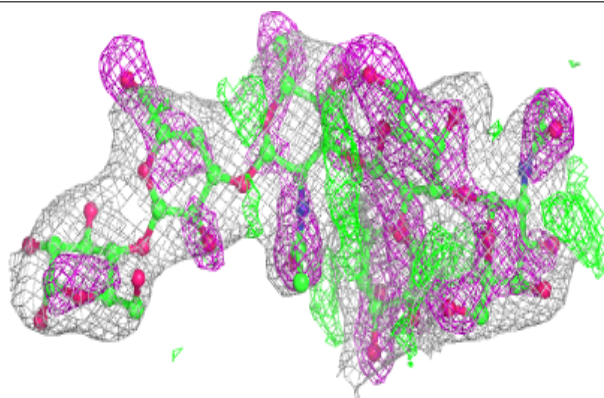
The following is a graphical depiction of the model fit to experimental electron density for oligosaccharide. Each fit is shown from different orientation to approximate a three-dimensional view.

**Electron density around Chain E:**

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

**Electron density around Chain F:**

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



## 6.4 Ligands [i](#)

There are no ligands in this entry.

## 6.5 Other polymers [i](#)

There are no such residues in this entry.