



# Full wwPDB X-ray Structure Validation Report ⓘ

Aug 22, 2023 – 03:28 PM EDT

PDB ID : 2SBA  
Title : SOYBEAN AGGLUTININ COMPLEXED WITH 2,6-PENTASACCHARIDE  
Authors : Dessen, A.; Gupta, D.; Sabesan, S.; Brewer, C.F.; Sacchettini, J.C.  
Deposited on : 1998-12-03  
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](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>.

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

MolProbity : 4.02b-467  
Mogul : 1.8.5 (274361), CSD as541be (2020)  
Xtrriage (Phenix) : **NOT EXECUTED**  
EDS : **NOT EXECUTED**  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.35

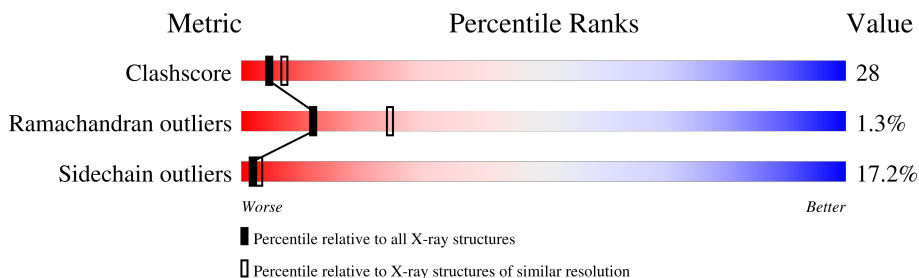
# 1 Overall quality at a glance

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))
Clashscore	141614	3518 (2.60-2.60)
Ramachandran outliers	138981	3455 (2.60-2.60)
Sidechain outliers	138945	3455 (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  $\geq 3$ , 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  $\leq 5\%$

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	253	 45% 38% 8% 8%
2	B	2	 50% 50%

## 2 Entry composition [i](#)

There are 5 unique types of molecules in this entry. The entry contains 1739 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 Lectin.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
			Total	C	N	O			
1	A	232	1688	1090	275	323	0	0	1

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



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
			Total	C	N	O			
2	B	2	25	14	1	10	0	0	0

- Molecule 3 is MANGANESE (II) ION (three-letter code: MN) (formula: Mn).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	1	Total	Mn	0	0
			1	1		

- Molecule 4 is CALCIUM ION (three-letter code: CA) (formula: Ca).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	1	Total	Ca	0	0
			1	1		

- Molecule 5 is water.

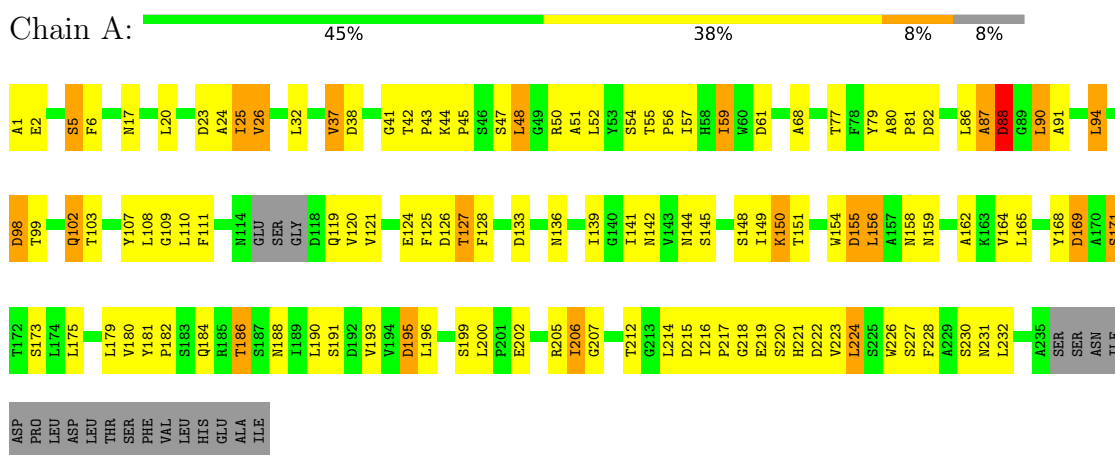
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	24	Total	O	0	0
			24	24		

### 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. 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. 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.

Note EDS was not executed.

- Molecule 1: Lectin



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



## 4 Data and refinement statistics

Xtrriage (Phenix) and EDS were not executed - this section is therefore incomplete.

Property	Value	Source
Space group	P 64 2 2	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	144.90Å 144.90Å 109.40Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	90.00 – 2.60	Depositor
% Data completeness (in resolution range)	80.0 (90.00-2.60)	Depositor
$R_{merge}$	0.13	Depositor
$R_{sym}$	0.13	Depositor
Refinement program	TNT 5E	Depositor
R, $R_{free}$	0.208 , (Not available)	Depositor
Estimated twinning fraction	No twinning to report.	Xtrriage
Total number of atoms	1739	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	30.0	wwPDB-VP

## 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, CA, GAL, MN

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	1.05	3/1735 (0.2%)	1.32	22/2391 (0.9%)

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	124	GLU	CD-OE1	9.12	1.35	1.25
1	A	2	GLU	CD-OE1	6.70	1.33	1.25
1	A	202	GLU	CD-OE2	5.89	1.32	1.25

All (22) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	126	ASP	CB-CG-OD2	-8.66	110.50	118.30
1	A	155	ASP	CB-CG-OD1	-7.54	111.51	118.30
1	A	133	ASP	CB-CG-OD1	-6.75	112.22	118.30
1	A	169	ASP	CB-CG-OD2	-6.55	112.40	118.30
1	A	215	ASP	CB-CG-OD1	-6.51	112.44	118.30
1	A	126	ASP	CB-CG-OD1	6.44	124.09	118.30
1	A	155	ASP	CB-CG-OD2	6.37	124.03	118.30
1	A	195	ASP	CB-CG-OD2	-6.17	112.75	118.30
1	A	133	ASP	CB-CG-OD2	6.12	123.81	118.30
1	A	61	ASP	CB-CG-OD1	-6.08	112.82	118.30
1	A	98	ASP	CB-CG-OD2	-6.01	112.89	118.30
1	A	222	ASP	CB-CG-OD2	-5.82	113.06	118.30
1	A	88	ASP	CB-CG-OD2	-5.78	113.10	118.30
1	A	98	ASP	CB-CG-OD1	5.49	123.24	118.30
1	A	82	ASP	CB-CG-OD2	-5.42	113.42	118.30
1	A	68	ALA	N-CA-CB	5.37	117.62	110.10
1	A	195	ASP	CB-CG-OD1	5.30	123.07	118.30
1	A	215	ASP	CB-CG-OD2	5.25	123.03	118.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	222	ASP	CB-CG-OD1	5.23	123.01	118.30
1	A	50	ARG	NE-CZ-NH1	5.22	122.91	120.30
1	A	82	ASP	CB-CG-OD1	5.06	122.85	118.30
1	A	61	ASP	CB-CG-OD2	5.04	122.83	118.30

There are no chirality outliers.

There are no planarity outliers.

## 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	1688	0	1548	92	0
2	B	25	0	22	1	0
3	A	1	0	0	0	0
4	A	1	0	0	0	0
5	A	24	0	0	3	0
All	All	1739	0	1570	93	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 28.

All (93) 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:90:LEU:HD23	1:A:91:ALA:N	1.92	0.84
1:A:48:LEU:HD11	1:A:109:GLY:HA3	1.63	0.80
1:A:128:PHE:HB3	5:A:887:HOH:O	1.81	0.79
1:A:51:ALA:C	1:A:52:LEU:HD23	2.05	0.77
1:A:51:ALA:O	1:A:52:LEU:HD23	1.88	0.72
1:A:37:VAL:HG22	1:A:42:THR:O	1.91	0.71
1:A:224:LEU:N	1:A:224:LEU:HD23	2.05	0.71
1:A:37:VAL:HG22	1:A:42:THR:C	2.10	0.71
1:A:1:ALA:HB1	1:A:232:LEU:O	1.92	0.70
1:A:94:LEU:HG	1:A:206:ILE:HG22	1.74	0.70
1:A:20:LEU:HD13	1:A:25:ILE:HA	1.75	0.69

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:155:ASP:H	1:A:188:ASN:HD21	1.40	0.68
1:A:125:PHE:HB3	1:A:154:TRP:CZ3	2.28	0.68
1:A:43:PRO:HD2	1:A:81:PRO:HG3	1.75	0.68
1:A:219:GLU:HG2	1:A:221:HIS:CE1	2.29	0.67
1:A:223:VAL:C	1:A:224:LEU:HD23	2.15	0.66
1:A:154:TRP:CE2	1:A:156:LEU:HB3	2.30	0.66
1:A:142:ASN:HB3	1:A:145:SER:O	1.97	0.64
1:A:79:TYR:HB3	1:A:220:SER:OG	1.98	0.63
1:A:103:THR:O	1:A:109:GLY:HA2	1.99	0.63
1:A:94:LEU:HD12	1:A:94:LEU:N	2.15	0.62
1:A:150:LYS:HE3	1:A:191:SER:O	2.00	0.61
1:A:54:SER:O	1:A:56:PRO:HD3	2.00	0.60
1:A:164:VAL:HG22	1:A:179:LEU:HD12	1.83	0.60
1:A:47:SER:HB3	1:A:212:THR:OG1	2.02	0.59
1:A:87:ALA:HB1	1:A:88:ASP:CG	2.25	0.57
1:A:37:VAL:CG2	1:A:43:PRO:HA	2.35	0.56
2:B:1:NAG:O5	2:B:1:NAG:H83	2.05	0.56
1:A:20:LEU:CD1	1:A:25:ILE:HA	2.36	0.56
1:A:87:ALA:HB2	1:A:128:PHE:HB2	1.88	0.55
1:A:94:LEU:HG	1:A:206:ILE:CG2	2.34	0.55
1:A:48:LEU:HD11	1:A:109:GLY:CA	2.36	0.55
1:A:25:ILE:HG12	1:A:26:VAL:N	2.16	0.55
1:A:37:VAL:HG22	1:A:43:PRO:HA	1.89	0.55
1:A:99:THR:N	5:A:896:HOH:O	2.39	0.54
1:A:155:ASP:H	1:A:188:ASN:ND2	2.05	0.53
1:A:162:ALA:HB2	1:A:181:TYR:CE1	2.44	0.53
1:A:81:PRO:HD2	1:A:218:GLY:O	2.09	0.53
1:A:139:ILE:HG13	1:A:154:TRP:HB2	1.90	0.52
1:A:154:TRP:NE1	1:A:156:LEU:HB3	2.25	0.52
1:A:79:TYR:HA	1:A:158:ASN:HD21	1.76	0.50
1:A:43:PRO:O	1:A:217:PRO:HB3	2.12	0.50
1:A:90:LEU:CD2	1:A:91:ALA:N	2.70	0.50
1:A:169:ASP:OD1	1:A:171:SER:OG	2.25	0.50
1:A:23:ASP:O	1:A:25:ILE:HG22	2.12	0.50
1:A:51:ALA:O	1:A:207:GLY:HA3	2.12	0.49
1:A:206:ILE:HD12	1:A:226:TRP:CZ2	2.47	0.49
1:A:154:TRP:C	1:A:154:TRP:CD1	2.84	0.49
1:A:80:ALA:H	1:A:158:ASN:HD21	1.62	0.48
1:A:91:ALA:CB	1:A:110:LEU:HD11	2.43	0.48
1:A:184:GLN:HB2	1:A:186:THR:HB	1.95	0.48
1:A:24:ALA:C	1:A:25:ILE:HG22	2.34	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:79:TYR:O	1:A:219:GLU:HA	2.14	0.48
1:A:6:PHE:CE2	1:A:228:PHE:HB3	2.49	0.47
1:A:102:GLN:HB3	1:A:103:THR:H	1.48	0.47
1:A:173:SER:O	1:A:193:VAL:HA	2.15	0.47
1:A:90:LEU:HD23	1:A:91:ALA:H	1.73	0.47
1:A:5:SER:HA	1:A:228:PHE:O	2.14	0.47
1:A:38:ASP:O	1:A:41:GLY:N	2.38	0.47
1:A:110:LEU:HB2	1:A:111:PHE:CE1	2.49	0.46
1:A:87:ALA:HB1	1:A:88:ASP:OD1	2.15	0.46
1:A:59:ILE:HD12	1:A:59:ILE:HA	1.54	0.46
1:A:87:ALA:HA	1:A:88:ASP:HA	1.70	0.46
1:A:219:GLU:HG2	1:A:219:GLU:O	2.16	0.46
1:A:156:LEU:C	1:A:156:LEU:HD23	2.36	0.46
1:A:142:ASN:HD22	1:A:148:SER:HA	1.80	0.46
1:A:195:ASP:O	1:A:199:SER:OG	2.29	0.46
1:A:17:ASN:O	1:A:54:SER:OG	2.27	0.45
1:A:91:ALA:HB3	1:A:110:LEU:HD11	1.98	0.45
1:A:54:SER:O	1:A:55:THR:C	2.54	0.45
1:A:142:ASN:N	1:A:142:ASN:ND2	2.62	0.44
1:A:199:SER:O	1:A:200:LEU:HG	2.18	0.44
1:A:195:ASP:OD1	1:A:196:LEU:N	2.51	0.43
1:A:127:THR:HG21	1:A:219:GLU:OE1	2.19	0.43
1:A:141:ILE:C	1:A:142:ASN:HD22	2.21	0.43
1:A:32:LEU:HB3	1:A:223:VAL:HB	2.00	0.43
1:A:180:VAL:O	1:A:182:PRO:HD3	2.19	0.43
1:A:205:ARG:HA	5:A:858:HOH:O	2.18	0.43
1:A:90:LEU:CD2	1:A:90:LEU:C	2.87	0.42
1:A:37:VAL:HG22	1:A:43:PRO:CA	2.49	0.42
1:A:79:TYR:CD1	1:A:80:ALA:N	2.87	0.42
1:A:80:ALA:H	1:A:158:ASN:ND2	2.17	0.42
1:A:139:ILE:O	1:A:151:THR:HA	2.19	0.42
1:A:142:ASN:ND2	1:A:148:SER:HA	2.35	0.42
1:A:44:LYS:HA	1:A:45:PRO:HD3	1.95	0.42
1:A:108:LEU:O	1:A:110:LEU:HG	2.20	0.42
1:A:214:LEU:O	1:A:214:LEU:HD12	2.20	0.41
1:A:111:PHE:CD1	1:A:111:PHE:N	2.87	0.41
1:A:156:LEU:HD23	1:A:156:LEU:O	2.20	0.41
1:A:107:TYR:HD2	1:A:111:PHE:HB2	1.86	0.41
1:A:150:LYS:HD2	1:A:190:LEU:HD11	2.03	0.41
1:A:120:VAL:CG1	1:A:121:VAL:N	2.84	0.40
1:A:168:TYR:HB2	1:A:175:LEU:HD12	2.03	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	228/253 (90%)	203 (89%)	22 (10%)	3 (1%)	12 24

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	87	ALA
1	A	144	ASN
1	A	136	ASN

### 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	169/219 (77%)	140 (83%)	29 (17%)	2 3

All (29) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	5	SER
1	A	25	ILE
1	A	26	VAL
1	A	37	VAL
1	A	48	LEU

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Mol	Chain	Res	Type
1	A	57	ILE
1	A	59	ILE
1	A	77	THR
1	A	86	LEU
1	A	88	ASP
1	A	90	LEU
1	A	94	LEU
1	A	98	ASP
1	A	102	GLN
1	A	119	GLN
1	A	127	THR
1	A	149	ILE
1	A	150	LYS
1	A	156	LEU
1	A	159	ASN
1	A	165	LEU
1	A	171	SER
1	A	186	THR
1	A	206	ILE
1	A	216	ILE
1	A	224	LEU
1	A	227	SER
1	A	230	SER
1	A	231	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	142	ASN
1	A	158	ASN
1	A	184	GLN
1	A	188	ASN
1	A	231	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](#)

2 monosaccharides are modelled in this entry.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
2	NAG	B	1	2	14,14,15	1.17	1 (7%)	17,19,21	1.00	1 (5%)
2	GAL	B	2	2	11,11,12	1.18	2 (18%)	15,15,17	1.73	4 (26%)

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	NAG	B	1	2	-	4/6/23/26	0/1/1/1
2	GAL	B	2	2	-	0/2/19/22	0/1/1/1

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	1	NAG	C8-C7	3.25	1.57	1.50
2	B	2	GAL	C1-C2	2.24	1.57	1.52
2	B	2	GAL	O5-C1	2.15	1.47	1.43

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	2	GAL	C1-O5-C5	3.52	116.96	112.19
2	B	2	GAL	C6-C5-C4	-3.25	105.40	113.00
2	B	2	GAL	O2-C2-C1	2.41	114.07	109.15

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	2	GAL	O6-C6-C5	2.21	118.86	111.29
2	B	1	NAG	C1-O5-C5	2.17	115.13	112.19

There are no chirality outliers.

All (4) torsion outliers are listed below:

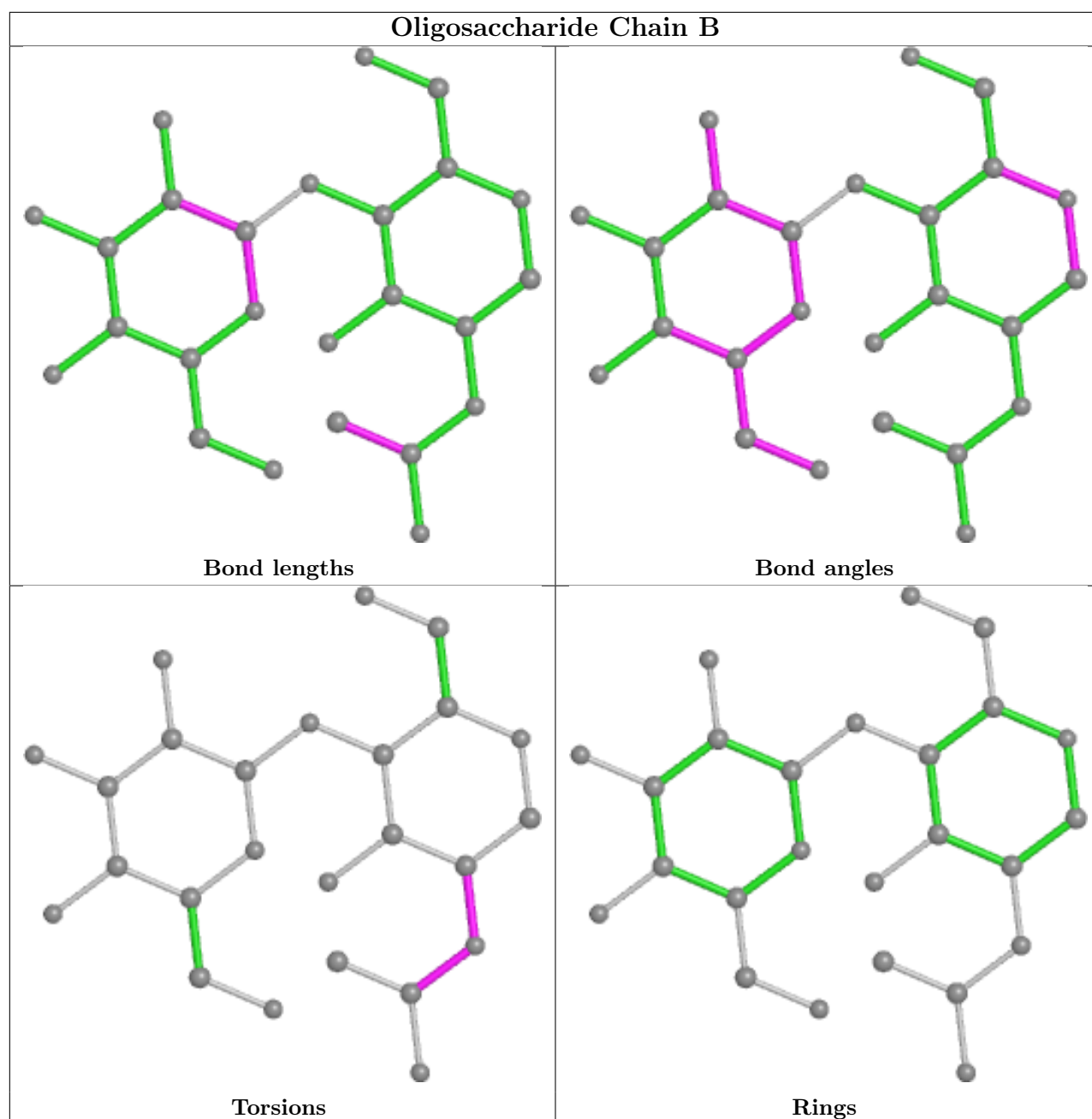
Mol	Chain	Res	Type	Atoms
2	B	1	NAG	C8-C7-N2-C2
2	B	1	NAG	O7-C7-N2-C2
2	B	1	NAG	C1-C2-N2-C7
2	B	1	NAG	C3-C2-N2-C7

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	B	1	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](#)

Of 2 ligands modelled in this entry, 2 are monoatomic - leaving 0 for Mogul analysis.

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

### 6.1 Protein, DNA and RNA chains

EDS was not executed - this section is therefore empty.

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

EDS was not executed - this section is therefore empty.

### 6.3 Carbohydrates

EDS was not executed - this section is therefore empty.

### 6.4 Ligands

EDS was not executed - this section is therefore empty.

### 6.5 Other polymers

EDS was not executed - this section is therefore empty.