



# Full wwPDB X-ray Structure Validation Report ⓘ

Oct 23, 2024 – 12:50 AM EDT

PDB ID : 4R9J  
Title : L-ficolin complexed to glucosamine-6-sulfate  
Authors : Laffly, E.; Lacroix, M.; Martin, L.; Vassal-Stermann, E.; Thielens, N.; Gaboriaud, C.  
Deposited on : 2014-09-05  
Resolution : 2.10 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 : 2022.3.0, CSD as543be (2022)  
Xtrriage (Phenix) : 1.20.1  
EDS : 3.0  
buster-report : 1.1.7 (2018)  
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)  
CCP4 : 9.0.003 (Gargrove)  
Density-Fitness : 1.0.11  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.39

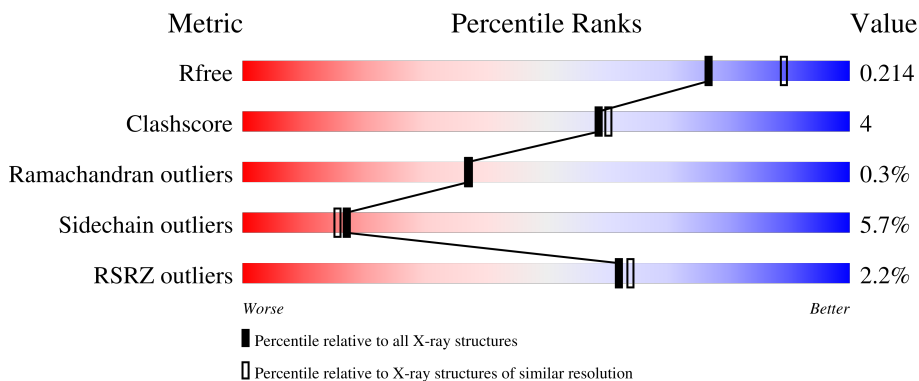
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.10 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))
$R_{free}$	164625	6234 (2.10-2.10)
Clashscore	180529	6893 (2.10-2.10)
Ramachandran outliers	177936	6839 (2.10-2.10)
Sidechain outliers	177891	6840 (2.10-2.10)
RSRZ outliers	164620	6234 (2.10-2.10)

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	217	 86% 11%
1	B	217	 84% 13%
1	G	217	 85% 12%
2	C	3	 100%

## 2 Entry composition [i](#)

There are 8 unique types of molecules in this entry. The entry contains 5653 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 Ficolin-2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	G	217	Total 1769	C 1112	N 313	O 335	S 9	0	4	0
1	A	217	Total 1760	C 1109	N 310	O 332	S 9	0	3	0
1	B	217	Total 1752	C 1105	N 308	O 330	S 9	0	2	0

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



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

- Molecule 3 is CALCIUM ION (three-letter code: CA) (formula: Ca).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	G	1	Total Ca 1 1	0	0
3	A	2	Total Ca 2 2	0	0
3	B	1	Total Ca 1 1	0	0

- Molecule 4 is ACETATE ION (three-letter code: ACT) (formula: C<sub>2</sub>H<sub>3</sub>O<sub>2</sub>).



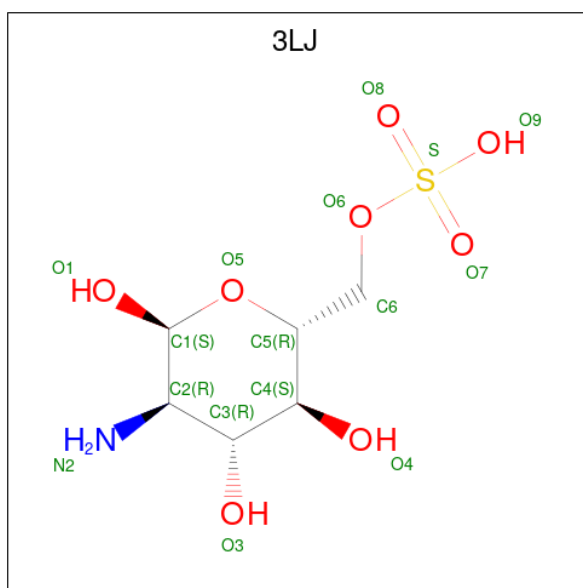
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	G	1	Total C O 4 2 2	0	0
4	G	1	Total C O 4 2 2	0	0
4	G	1	Total C O 4 2 2	0	0
4	A	1	Total C O 4 2 2	0	0
4	A	1	Total C O 4 2 2	0	0
4	B	1	Total C O 4 2 2	0	0
4	B	1	Total C O 4 2 2	0	0

- Molecule 5 is SULFATE ION (three-letter code: SO4) (formula: O<sub>4</sub>S).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
5	G	1	Total	O	S			
			5	4	1	0	0	

- Molecule 6 is 2-amino-2-deoxy-6-O-sulfo-alpha-D-glucopyranose (three-letter code: 3LJ) (formula:  $C_6H_{13}NO_8S$ ).



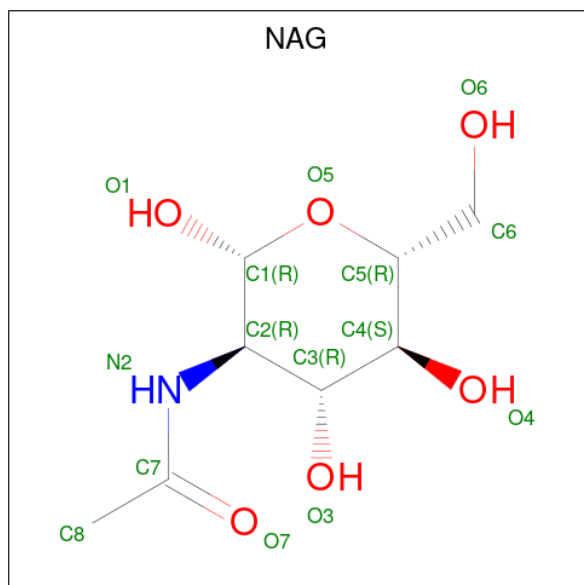
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
6	A	1	Total	C	N	O	S		
			16	6	1	8	1	0	0
6	B	1	Total	C	N	O	S		
			16	6	1	8	1	0	0

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Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	S		
6	B	1	16	6	1	8	1	0	0

- Molecule 7 is 2-acetamido-2-deoxy-beta-D-glucopyranose (three-letter code: NAG) (formula:  $C_8H_{15}NO_6$ ).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
7	A	1	14	8	1	5	0	0

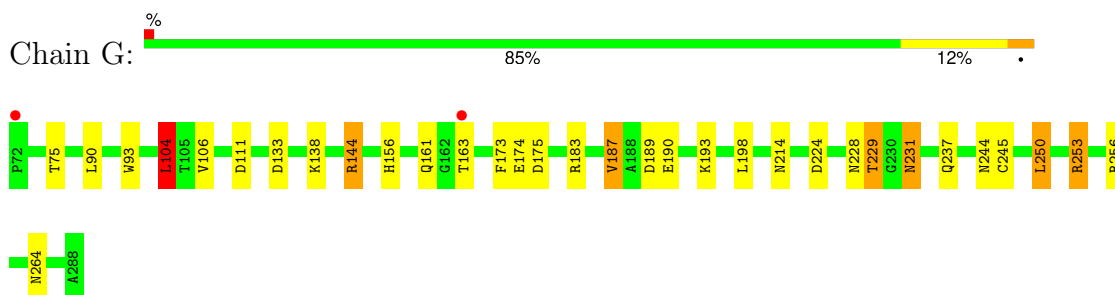
- Molecule 8 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
8	G	89	Total	O	0	0
			89	89		
8	A	99	Total	O	0	0
			99	99		
8	B	46	Total	O	0	0
			46	46		

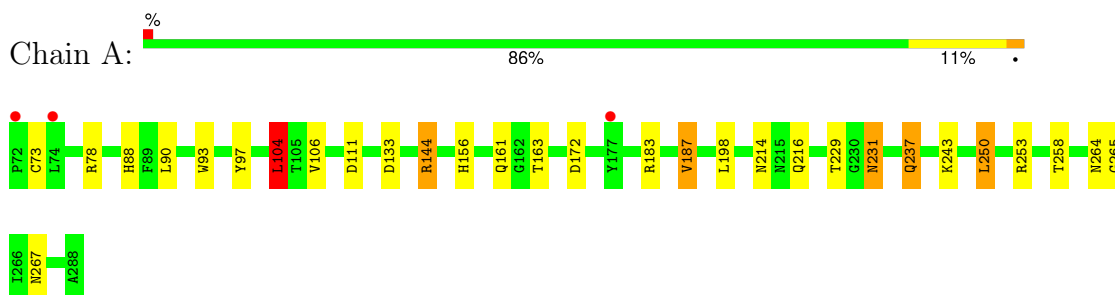
### 3 Residue-property plots [i](#)

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.

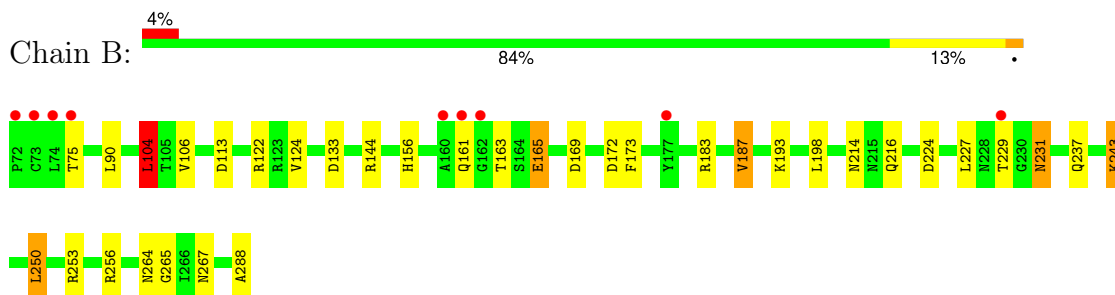
- Molecule 1: Ficolin-2



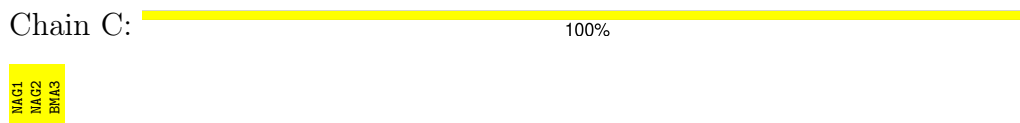
- Molecule 1: Ficolin-2



- Molecule 1: Ficolin-2



- Molecule 2: beta-D-mannopyranose-(1-4)-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 32 2 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	97.17Å 97.17Å 139.99Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	19.96 – 2.10 19.96 – 2.10	Depositor EDS
% Data completeness (in resolution range)	99.8 (19.96-2.10) 99.8 (19.96-2.10)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	6.12 (at 2.09Å)	Xtrriage
Refinement program	REFMAC 5.7.0032	Depositor
R, $R_{free}$	0.172 , 0.203 0.181 , 0.214	Depositor DCC
$R_{free}$ test set	2259 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	19.2	Xtrriage
Anisotropy	0.116	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.36 , 36.7	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	0.026 for -h,-k,l	Xtrriage
$F_o, F_c$ correlation	0.94	EDS
Total number of atoms	5653	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	21.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.32% 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: 3LJ, SO4, ACT, NAG, BMA, CA

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	0.95	0/1808	1.02	9/2446 (0.4%)
1	B	0.89	0/1800	0.98	9/2436 (0.4%)
1	G	0.97	0/1817	1.03	12/2459 (0.5%)
All	All	0.94	0/5425	1.01	30/7341 (0.4%)

There are no bond length outliers.

All (30) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	G	144	ARG	NE-CZ-NH2	-9.16	115.72	120.30
1	A	111	ASP	CB-CG-OD1	-8.58	110.58	118.30
1	B	133	ASP	CB-CG-OD1	6.93	124.54	118.30
1	B	144	ARG	NE-CZ-NH2	-6.33	117.13	120.30
1	A	250	LEU	CB-CG-CD1	6.30	121.71	111.00
1	G	253[A]	ARG	NE-CZ-NH1	6.19	123.39	120.30
1	G	253[B]	ARG	NE-CZ-NH1	6.19	123.39	120.30
1	A	172	ASP	CB-CG-OD2	-6.07	112.83	118.30
1	G	133	ASP	CB-CG-OD1	5.98	123.68	118.30
1	A	133	ASP	CB-CG-OD1	5.75	123.48	118.30
1	G	250	LEU	CB-CG-CD1	5.74	120.76	111.00
1	A	133	ASP	CB-CG-OD2	-5.72	113.16	118.30
1	G	224	ASP	CB-CG-OD1	5.69	123.42	118.30
1	G	189[A]	ASP	CB-CG-OD1	5.69	123.42	118.30
1	G	189[B]	ASP	CB-CG-OD1	5.69	123.42	118.30
1	G	104	LEU	CB-CG-CD2	5.68	120.65	111.00
1	B	250	LEU	CB-CG-CD1	5.62	120.55	111.00
1	B	169	ASP	CB-CG-OD2	5.54	123.29	118.30
1	B	104	LEU	CB-CG-CD2	5.54	120.42	111.00
1	G	111	ASP	CB-CG-OD2	5.38	123.15	118.30
1	B	224	ASP	CB-CG-OD1	5.37	123.14	118.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	G	144	ARG	NE-CZ-NH1	5.37	122.98	120.30
1	B	122	ARG	NE-CZ-NH1	5.33	122.97	120.30
1	A	144	ARG	NE-CZ-NH2	-5.29	117.66	120.30
1	A	183	ARG	NE-CZ-NH1	5.26	122.93	120.30
1	A	111	ASP	CB-CG-OD2	5.24	123.01	118.30
1	B	144	ARG	NE-CZ-NH1	5.16	122.88	120.30
1	A	104	LEU	CB-CG-CD2	5.13	119.72	111.00
1	G	193	LYS	CA-CB-CG	-5.05	102.28	113.40
1	B	172	ASP	CB-CG-OD1	5.03	122.83	118.30

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	1760	0	1635	15	0
1	B	1752	0	1628	12	1
1	G	1769	0	1636	18	1
2	C	39	0	34	0	0
3	A	2	0	0	0	0
3	B	1	0	0	0	0
3	G	1	0	0	0	0
4	A	8	0	6	0	0
4	B	8	0	6	0	0
4	G	12	0	9	0	0
5	G	5	0	0	0	0
6	A	16	0	10	0	0
6	B	32	0	20	1	0
7	A	14	0	13	0	0
8	A	99	0	0	1	0
8	B	46	0	0	0	0
8	G	89	0	0	4	0
All	All	5653	0	4997	45	1

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 4.

All (45) 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:73:CYS:SG	1:A:78:ARG:NH2	2.59	0.75
1:G:229:THR:HG21	8:G:420:HOH:O	1.89	0.71
1:A:237:GLN:HE22	1:A:264:ASN:HD22	1.45	0.65
1:G:144:ARG:NH2	8:G:435:HOH:O	2.28	0.62
8:G:435:HOH:O	1:A:88:HIS:HD2	1.84	0.61
1:A:258[A]:THR:HG22	8:A:460:HOH:O	1.99	0.61
1:G:138:LYS:HE3	1:G:190:GLU:OE1	2.02	0.60
1:A:198:LEU:H	1:A:214:ASN:ND2	2.00	0.59
1:B:156:HIS:HD2	1:B:187:VAL:O	1.88	0.57
1:A:78:ARG:HD3	1:A:97:TYR:O	2.05	0.57
1:G:156:HIS:HD2	1:G:187:VAL:O	1.88	0.56
1:A:156:HIS:HD2	1:A:187:VAL:O	1.89	0.56
1:G:198:LEU:H	1:G:214:ASN:ND2	2.04	0.55
1:B:198:LEU:H	1:B:214:ASN:ND2	2.06	0.54
1:A:237:GLN:HE21	1:A:253:ARG:HD3	1.73	0.54
1:G:237:GLN:NE2	1:G:264:ASN:HD22	2.06	0.53
1:G:138:LYS:CE	1:G:190:GLU:OE1	2.57	0.53
1:G:237:GLN:HE22	1:G:253[A]:ARG:HH11	1.57	0.52
1:G:237:GLN:NE2	1:G:253[A]:ARG:HD3	2.25	0.51
1:B:104:LEU:HD13	1:B:106:VAL:CG1	2.42	0.50
1:G:228:ASN:ND2	1:G:244[A]:ASN:OD1	2.42	0.49
1:B:165:GLU:CG	1:B:288:ALA:HA	2.42	0.49
1:B:237[A]:GLN:NE2	1:B:264:ASN:HD22	2.10	0.49
1:A:104:LEU:HD13	1:A:106:VAL:CG1	2.42	0.49
1:B:231:ASN:C	1:B:231:ASN:HD22	2.16	0.49
1:B:237[A]:GLN:NE2	1:B:253:ARG:HD3	2.28	0.49
1:G:93:TRP:CZ2	1:G:144:ARG:HA	2.49	0.48
1:G:104:LEU:HD13	1:G:106:VAL:CG1	2.43	0.48
1:G:237:GLN:HE21	1:G:264:ASN:HD22	1.62	0.48
1:A:265:GLY:H	1:A:267:ASN:HD21	1.61	0.48
1:G:174:GLU:HG3	8:G:444:HOH:O	2.14	0.47
1:G:244[B]:ASN:N	1:G:245:CYS:HA	2.30	0.47
1:G:231:ASN:C	1:G:231:ASN:HD22	2.19	0.46
1:A:237:GLN:NE2	1:A:264:ASN:HD22	2.11	0.46
1:B:183:ARG:HB3	6:B:305:3LJ:O8	2.16	0.45
1:B:227:LEU:HD12	1:B:243:LYS:HG2	1.99	0.44
1:B:216:GLN:HB2	1:B:243:LYS:HE3	1.99	0.44
1:A:216:GLN:HB2	1:A:243:LYS:HE3	2.00	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:G:244[A]:ASN:N	1:G:245:CYS:HA	2.34	0.43
1:A:231:ASN:HD22	1:A:231:ASN:C	2.21	0.43
1:G:173:PHE:CE2	1:G:256:ARG:HA	2.54	0.43
1:A:93:TRP:CZ2	1:A:144:ARG:HA	2.54	0.43
1:B:173:PHE:CE1	1:B:256:ARG:HA	2.54	0.43
1:B:265:GLY:H	1:B:267:ASN:HD21	1.68	0.42
1:A:265:GLY:H	1:A:267:ASN:ND2	2.18	0.41

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:G:183:ARG:NH1	1:B:288:ALA:O[4_545]	2.19	0.01

## 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	218/217 (100%)	207 (95%)	10 (5%)	1 (0%)	25	23
1	B	217/217 (100%)	207 (95%)	9 (4%)	1 (0%)	25	23
1	G	219/217 (101%)	208 (95%)	11 (5%)	0	100	100
All	All	654/651 (100%)	622 (95%)	30 (5%)	2 (0%)	37	37

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	163	THR
1	B	124	VAL

### 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	185/182 (102%)	177 (96%)	8 (4%)	25	25
1	B	184/182 (101%)	170 (92%)	14 (8%)	11	8
1	G	186/182 (102%)	175 (94%)	11 (6%)	16	14
All	All	555/546 (102%)	522 (94%)	33 (6%)	17	14

All (33) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	G	75[A]	THR
1	G	75[B]	THR
1	G	90	LEU
1	G	104	LEU
1	G	161	GLN
1	G	163	THR
1	G	175	ASP
1	G	187	VAL
1	G	229	THR
1	G	231	ASN
1	G	250	LEU
1	A	90	LEU
1	A	104	LEU
1	A	161	GLN
1	A	187	VAL
1	A	229	THR
1	A	231	ASN
1	A	237	GLN
1	A	250	LEU
1	B	75	THR
1	B	90[A]	LEU
1	B	90[B]	LEU
1	B	104	LEU
1	B	113	ASP
1	B	161	GLN
1	B	163	THR

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Mol	Chain	Res	Type
1	B	165	GLU
1	B	187	VAL
1	B	193	LYS
1	B	229	THR
1	B	231	ASN
1	B	243	LYS
1	B	250	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (21) such sidechains are listed below:

Mol	Chain	Res	Type
1	G	156	HIS
1	G	161	GLN
1	G	214	ASN
1	G	216	GLN
1	G	231	ASN
1	G	237	GLN
1	G	267	ASN
1	A	88	HIS
1	A	156	HIS
1	A	195	ASN
1	A	214	ASN
1	A	231	ASN
1	A	237	GLN
1	A	267	ASN
1	A	275	ASN
1	B	139	GLN
1	B	156	HIS
1	B	195	ASN
1	B	214	ASN
1	B	231	ASN
1	B	267	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

3 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	C	1	2,1	14,14,15	0.88	0	17,19,21	1.94	6 (35%)
2	NAG	C	2	2	14,14,15	0.79	0	17,19,21	1.42	2 (11%)
2	BMA	C	3	2	11,11,12	0.69	0	15,15,17	2.67	7 (46%)

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	C	1	2,1	-	0/6/23/26	0/1/1/1
2	NAG	C	2	2	-	0/6/23/26	0/1/1/1
2	BMA	C	3	2	-	0/2/19/22	0/1/1/1

There are no bond length outliers.

All (15) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	3	BMA	C3-C4-C5	5.55	120.29	110.23
2	C	3	BMA	C6-C5-C4	-4.70	101.48	113.02
2	C	3	BMA	C1-C2-C3	4.34	115.97	109.64
2	C	1	NAG	C1-C2-N2	-3.93	104.25	110.43
2	C	1	NAG	C8-C7-N2	3.64	122.15	116.12
2	C	2	NAG	C1-O5-C5	-3.55	107.43	112.19
2	C	3	BMA	C1-O5-C5	3.54	116.93	112.19
2	C	1	NAG	C4-C3-C2	-3.02	106.59	111.02
2	C	3	BMA	O2-C2-C3	-2.62	104.73	110.15
2	C	3	BMA	O5-C5-C6	2.41	112.36	107.66
2	C	2	NAG	O7-C7-C8	-2.36	117.84	122.05
2	C	1	NAG	O5-C5-C6	-2.31	103.17	107.66

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	1	NAG	O7-C7-N2	-2.24	118.03	121.98
2	C	3	BMA	O4-C4-C3	-2.12	105.37	110.38
2	C	1	NAG	C6-C5-C4	-2.11	107.84	113.02

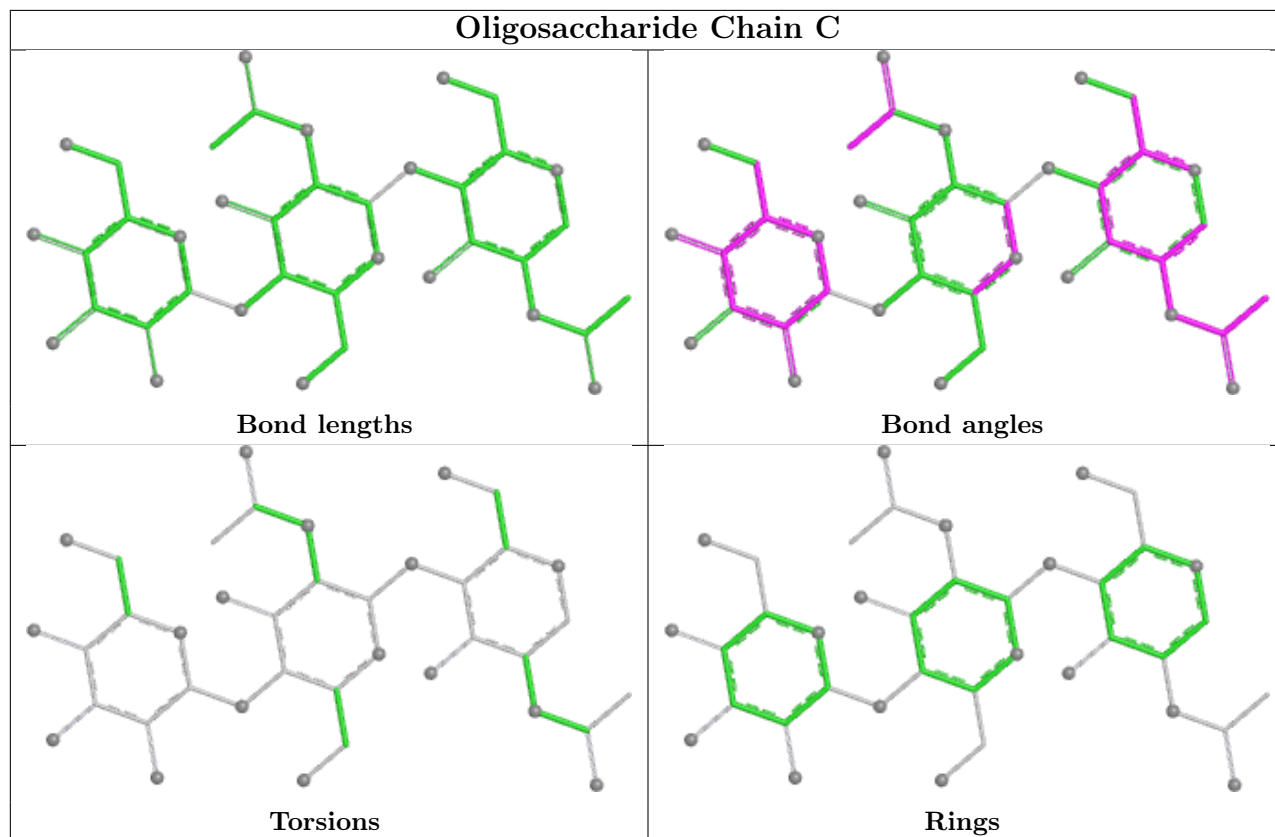
There are no chirality outliers.

There are no torsion outliers.

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](#)

Of 16 ligands modelled in this entry, 4 are monoatomic - leaving 12 for Mogul analysis.

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	ACT	G	302	-	3,3,3	0.76	0	3,3,3	0.26	0
4	ACT	B	303	-	3,3,3	0.97	0	3,3,3	0.74	0
4	ACT	G	304	-	3,3,3	1.31	0	3,3,3	0.52	0
6	3LJ	B	304	-	16,16,16	0.99	1 (6%)	22,24,24	2.18	4 (18%)
6	3LJ	B	305	-	16,16,16	1.04	0	22,24,24	1.87	6 (27%)
6	3LJ	A	305	-	16,16,16	1.08	0	22,24,24	2.53	6 (27%)
4	ACT	A	303	-	3,3,3	1.26	0	3,3,3	0.73	0
7	NAG	A	306	1	14,14,15	0.83	0	17,19,21	2.86	7 (41%)
5	SO4	G	305	-	4,4,4	0.42	0	6,6,6	0.51	0
4	ACT	G	303	-	3,3,3	1.14	0	3,3,3	1.71	2 (66%)
4	ACT	B	301	-	3,3,3	1.04	0	3,3,3	1.54	1 (33%)
4	ACT	A	302	-	3,3,3	0.87	0	3,3,3	1.04	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
6	3LJ	B	304	-	-	1/6/26/26	0/1/1/1
7	NAG	A	306	1	-	0/6/23/26	0/1/1/1
6	3LJ	B	305	-	-	1/6/26/26	0/1/1/1
6	3LJ	A	305	-	-	0/6/26/26	0/1/1/1

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	B	304	3LJ	C2-N2	-2.23	1.43	1.47

All (26) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
7	A	306	NAG	C1-O5-C5	9.58	125.03	112.19
6	B	304	3LJ	O5-C1-C2	7.07	117.76	109.51
6	A	305	3LJ	O5-C1-C2	6.71	117.34	109.51
6	A	305	3LJ	C1-C2-C3	4.79	116.91	110.60
6	B	304	3LJ	C1-O5-C5	4.78	122.90	113.65
6	A	305	3LJ	O4-C4-C5	4.14	119.53	109.32

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
6	B	305	3LJ	O9-S-O8	-4.00	94.56	108.56
6	A	305	3LJ	C1-O5-C5	3.90	121.19	113.65
6	B	305	3LJ	O6-S-O7	3.62	117.99	106.92
6	B	305	3LJ	O9-S-O6	-3.50	98.33	106.37
6	A	305	3LJ	O9-S-O6	-3.39	98.57	106.37
6	A	305	3LJ	O4-C4-C3	-3.03	103.24	110.38
7	A	306	NAG	O5-C1-C2	-2.99	106.66	111.29
7	A	306	NAG	C2-N2-C7	-2.76	119.20	122.90
6	B	304	3LJ	C4-C3-C2	-2.70	106.51	110.99
6	B	305	3LJ	O8-S-O7	2.69	122.62	112.24
6	B	305	3LJ	O9-S-O7	-2.67	99.22	108.56
6	B	305	3LJ	O6-S-O8	2.48	114.50	106.92
7	A	306	NAG	O7-C7-N2	-2.44	117.66	121.98
7	A	306	NAG	C8-C7-N2	2.28	119.89	116.12
7	A	306	NAG	C4-C3-C2	-2.26	107.71	111.02
6	B	304	3LJ	O6-S-O8	2.23	113.72	106.92
4	B	301	ACT	OXT-C-O	-2.22	113.79	122.03
7	A	306	NAG	O3-C3-C2	2.19	113.95	109.40
4	G	303	ACT	OXT-C-CH3	2.13	123.97	115.05
4	G	303	ACT	OXT-C-O	-2.05	114.41	122.03

There are no chirality outliers.

All (2) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
6	B	305	3LJ	C6-O6-S-O8
6	B	304	3LJ	C6-O6-S-O7

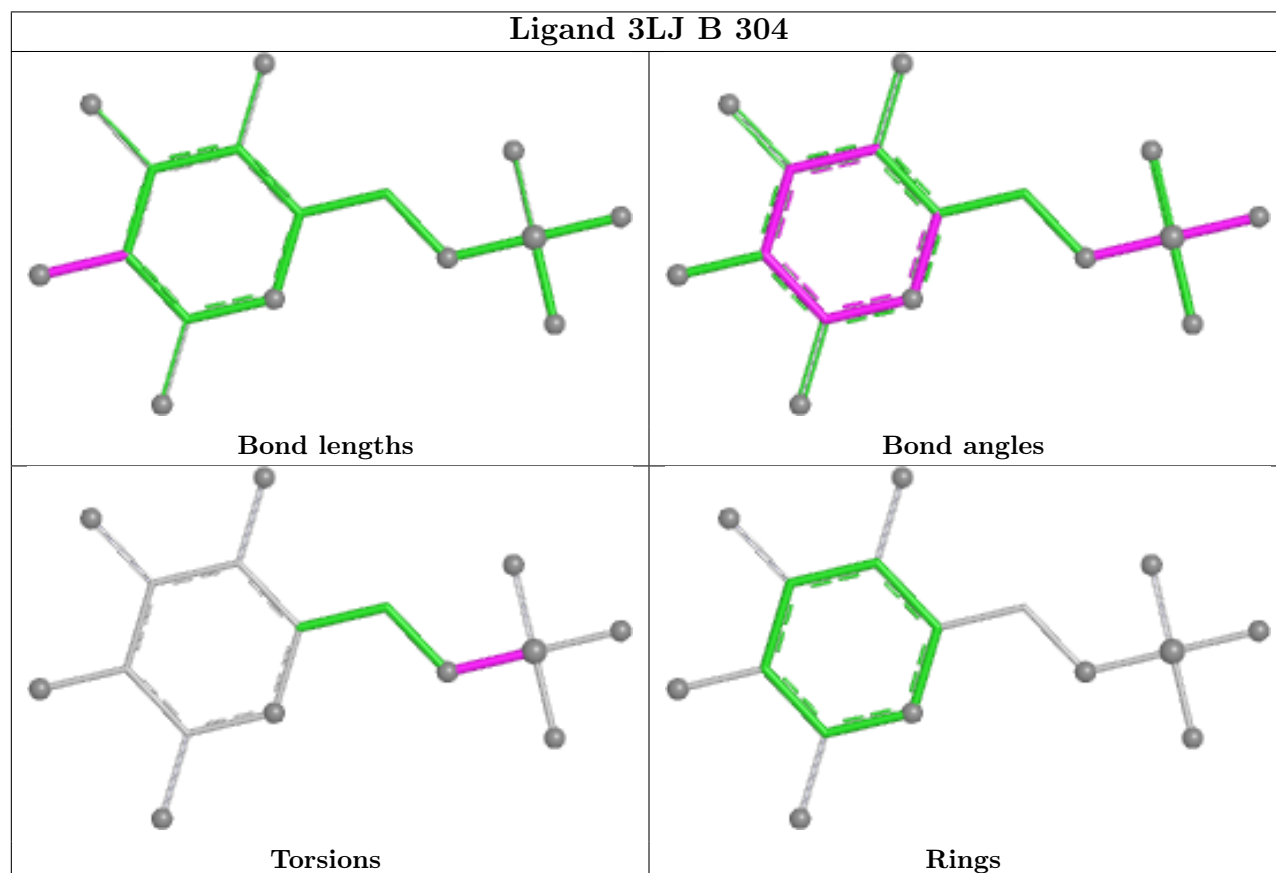
There are no ring outliers.

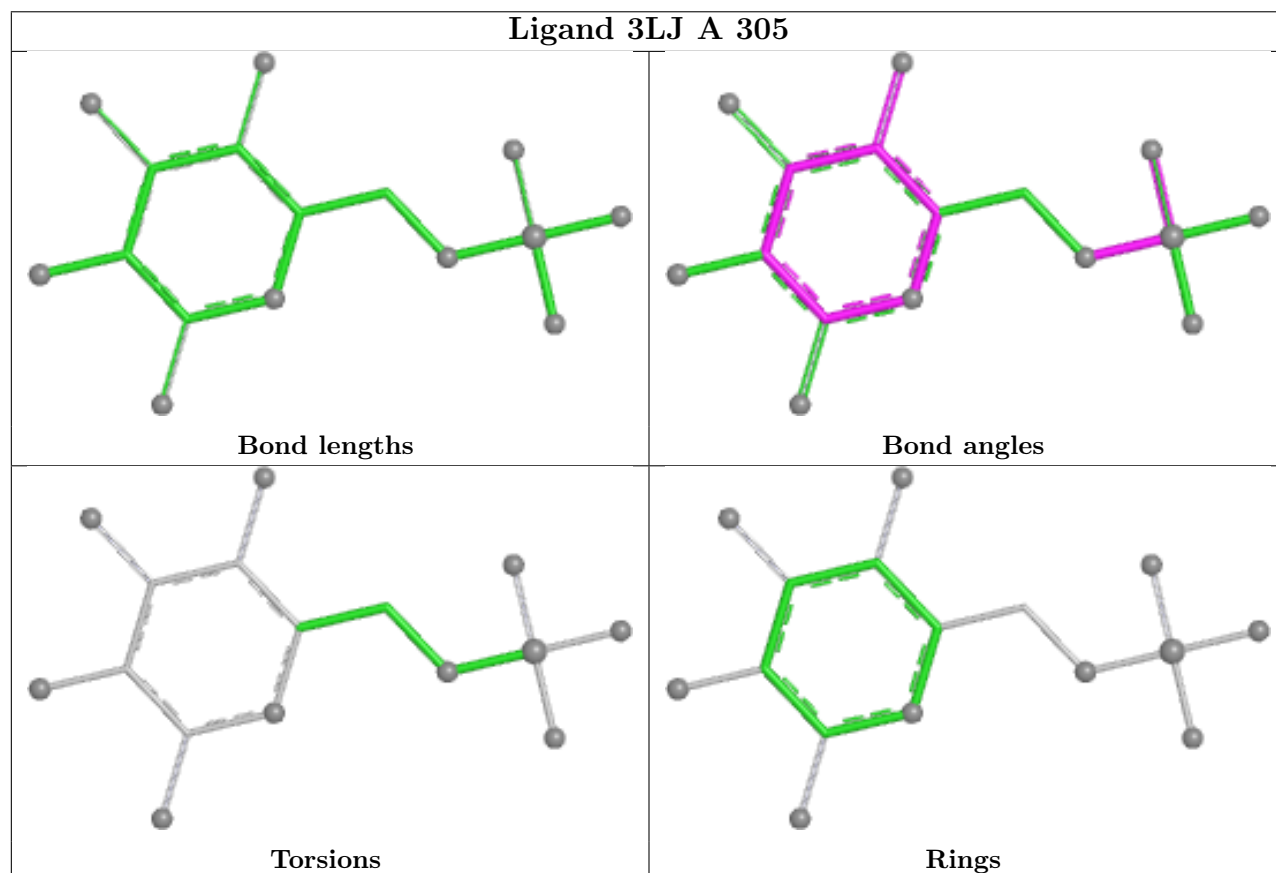
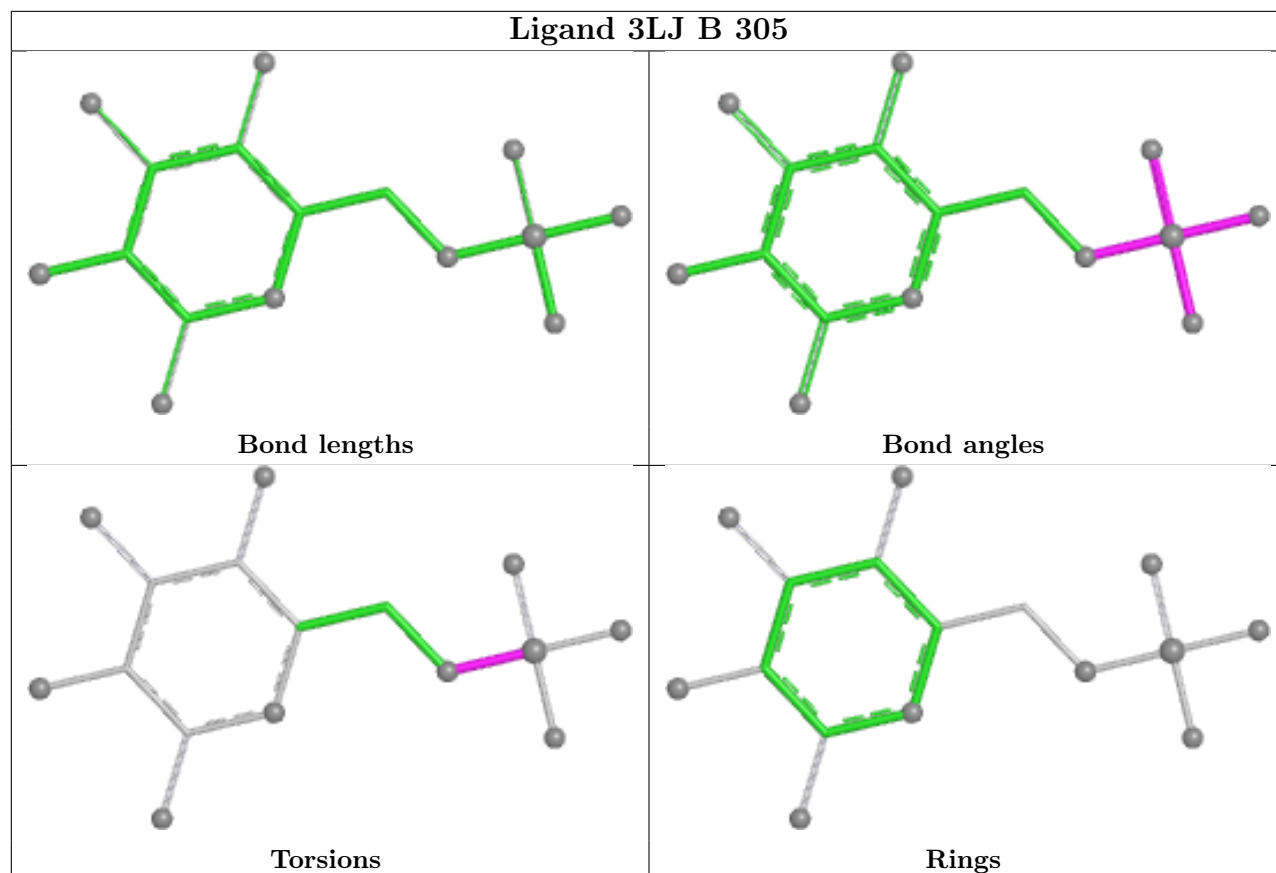
1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
6	B	305	3LJ	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 all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the

average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.





## 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	217/217 (100%)	-0.50	3 (1%) 73 74	7, 16, 38, 82	3 (1%)
1	B	217/217 (100%)	-0.16	9 (4%) 42 44	7, 23, 44, 78	2 (0%)
1	G	217/217 (100%)	-0.56	2 (0%) 81 82	7, 16, 29, 46	4 (1%)
All	All	651/651 (100%)	-0.41	14 (2%) 62 64	7, 18, 39, 82	9 (1%)

All (14) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	72	PRO	5.1
1	B	74	LEU	4.4
1	A	74	LEU	4.4
1	B	72	PRO	4.2
1	B	162	GLY	4.0
1	B	161	GLN	3.1
1	B	75	THR	2.7
1	A	177	TYR	2.5
1	G	72	PRO	2.4
1	B	160	ALA	2.3
1	B	177	TYR	2.2
1	G	163	THR	2.1
1	B	73	CYS	2.1
1	B	229	THR	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](#)

SUGAR-RSR INFOmissingINFO

### 6.4 Ligands [i](#)

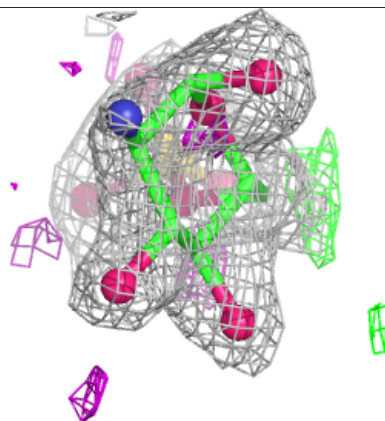
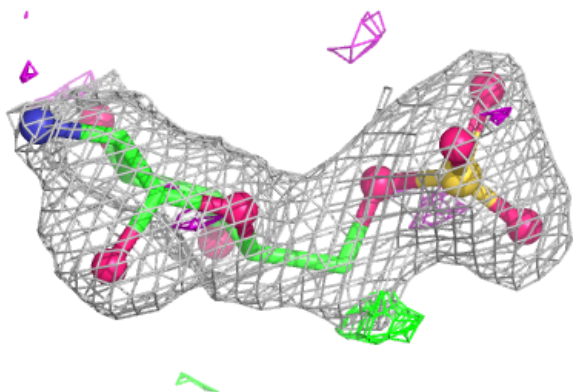
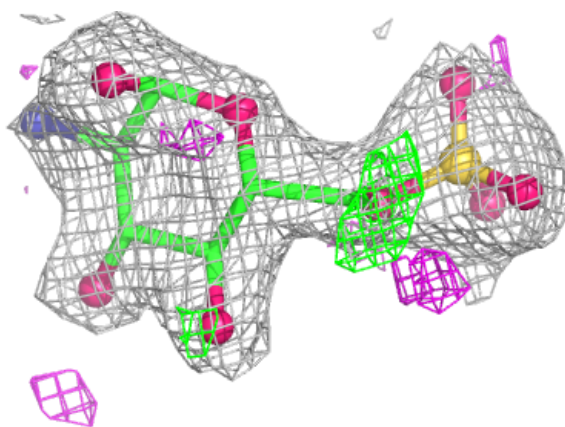
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95<sup>th</sup> percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 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	ACT	A	303	4/4	0.78	0.13	26,26,27,28	0
7	NAG	A	306	14/15	0.80	0.12	38,52,59,71	0
4	ACT	G	303	4/4	0.84	0.13	27,36,37,45	0
4	ACT	B	301	4/4	0.88	0.11	23,28,28,29	0
6	3LJ	B	305	16/16	0.90	0.09	31,36,39,43	0
3	CA	A	304	1/1	0.94	0.08	29,29,29,29	0
3	CA	B	302	1/1	0.95	0.06	28,28,28,28	0
6	3LJ	B	304	16/16	0.95	0.08	35,44,50,54	0
4	ACT	B	303	4/4	0.96	0.06	31,33,34,35	0
4	ACT	G	302	4/4	0.97	0.05	17,18,18,18	0
4	ACT	G	304	4/4	0.97	0.06	22,23,25,30	0
4	ACT	A	302	4/4	0.97	0.05	16,17,18,18	0
3	CA	A	301	1/1	0.98	0.02	16,16,16,16	0
3	CA	G	301	1/1	0.98	0.02	11,11,11,11	0
6	3LJ	A	305	16/16	0.98	0.06	15,28,31,36	0
5	SO4	G	305	5/5	0.99	0.04	24,27,29,35	0

The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.

**Electron density around 3LJ B 305:**

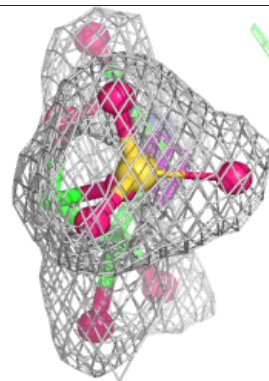
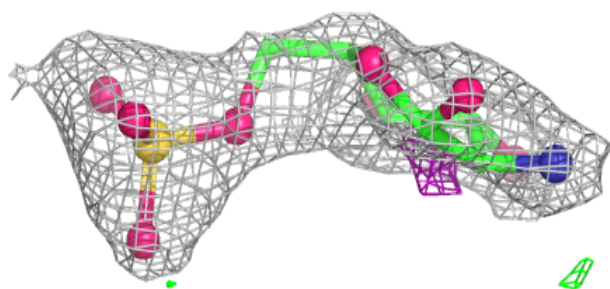
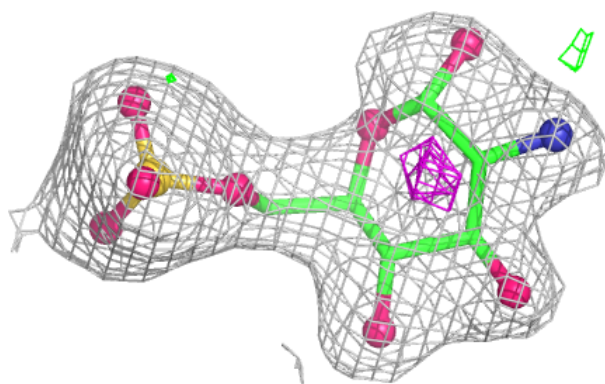
$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)

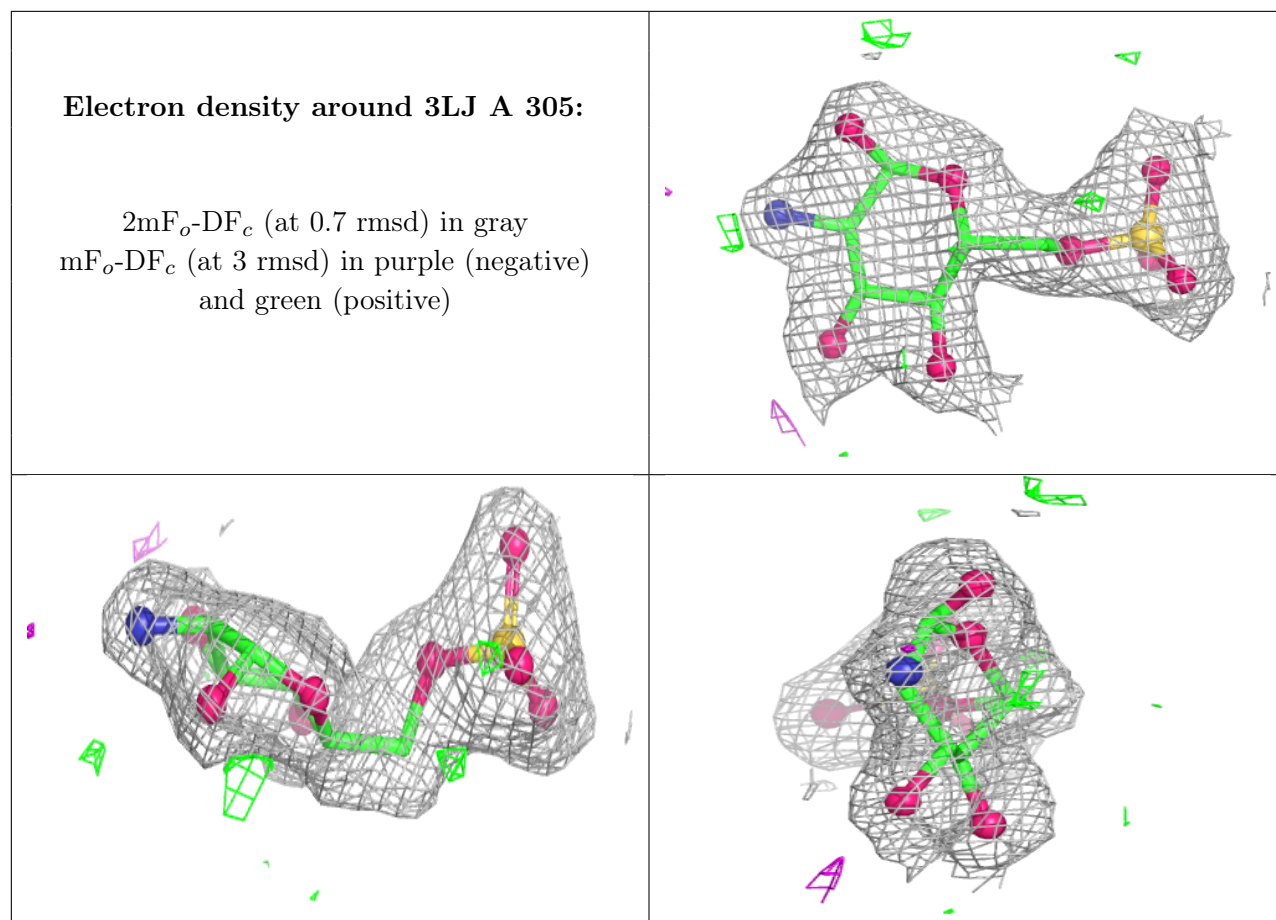




**Electron density around 3LJ B 304:**

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





## 6.5 Other polymers [i](#)

There are no such residues in this entry.