



# wwPDB X-ray Structure Validation Summary Report ⓘ

Dec 5, 2023 – 03:50 am GMT

PDB ID : 2J3U  
Title : L-ficolin complexed to galactose  
Authors : Garlatti, V.; Gaboriaud, C.  
Deposited on : 2006-08-23  
Resolution : 2.15 Å(reported)

This is a wwPDB X-ray Structure Validation Summary 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 : 1.8.4, CSD as541be (2020)  
Xtriage (Phenix) : 1.13  
EDS : 2.36  
buster-report : 1.1.7 (2018)  
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

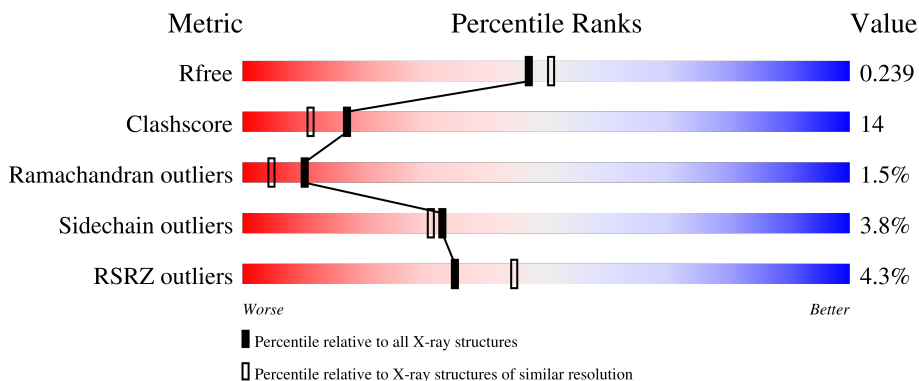
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.15 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	1479 (2.16-2.16)
Clashscore	141614	1585 (2.16-2.16)
Ramachandran outliers	138981	1560 (2.16-2.16)
Sidechain outliers	138945	1559 (2.16-2.16)
RSRZ outliers	127900	1456 (2.16-2.16)

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	218	 14% 65% 27% 6% •
1	B	218	 % 81% 18%
1	C	218	 2% 84% 13% ••
1	D	218	 6% 69% 25% ••
1	E	218	 82% 17% •

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Mol	Chain	Length	Quality of chain
1	F	218	<p>2% 82% 16%</p>
2	G	2	<p>50% 50%</p>
2	H	2	<p>100%</p>

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
2	NAG	G	2	-	-	-	X
4	ACT	B	1290	-	-	X	-
4	ACT	E	1290	-	-	X	-

## 2 Entry composition

There are 10 unique types of molecules in this entry. The entry contains 11129 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	A	217	Total 1767	C 1112	N 312	O 334	S 9	1	3	0
1	B	218	Total 1752	C 1101	N 310	O 332	S 9	3	1	0
1	C	214	Total 1721	C 1082	N 302	O 329	S 8	5	1	0
1	D	216	Total 1738	C 1092	N 306	O 331	S 9	2	1	0
1	E	218	Total 1752	C 1100	N 309	O 334	S 9	0	1	0
1	F	217	Total 1736	C 1092	N 305	O 330	S 9	0	0	0

There are 12 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	168	THR	VAL	conflict	UNP Q15485
A	247	THR	VAL	conflict	UNP Q15485
B	168	THR	VAL	conflict	UNP Q15485
B	247	THR	VAL	conflict	UNP Q15485
C	168	THR	VAL	conflict	UNP Q15485
C	247	THR	VAL	conflict	UNP Q15485
D	168	THR	VAL	conflict	UNP Q15485
D	247	THR	VAL	conflict	UNP Q15485
E	168	THR	VAL	conflict	UNP Q15485
E	247	THR	VAL	conflict	UNP Q15485
F	168	THR	VAL	conflict	UNP Q15485
F	247	THR	VAL	conflict	UNP Q15485

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

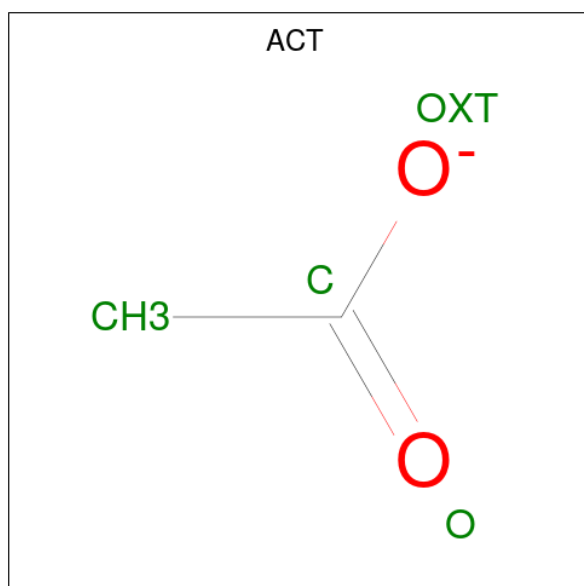


Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
2	G	2	Total	C	N	O	0	0	0
			28	16	2	10			
2	H	2	Total	C	N	O	0	0	0
			28	16	2	10			

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

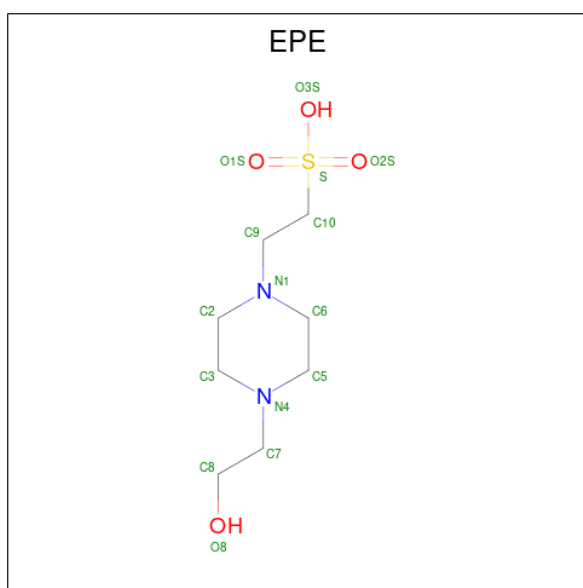
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	1	Total	Ca	0	0
			1	1		
3	B	1	Total	Ca	0	0
			1	1		
3	C	1	Total	Ca	0	0
			1	1		
3	D	1	Total	Ca	0	0
			1	1		
3	E	1	Total	Ca	0	0
			1	1		
3	F	1	Total	Ca	0	0
			1	1		

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



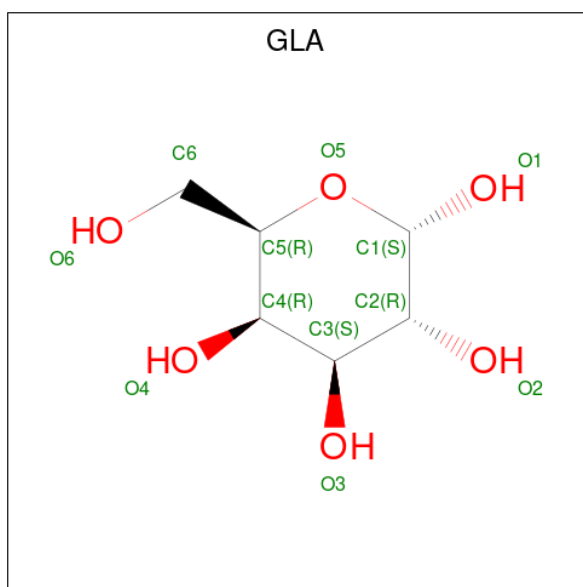
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	B	1	Total C O 4 2 2	0	0
4	B	1	Total C O 4 2 2	0	0
4	C	1	Total C O 4 2 2	0	0
4	E	1	Total C O 4 2 2	0	0
4	F	1	Total C O 4 2 2	0	0

- Molecule 5 is 4-(2-HYDROXYETHYL)-1-PIPERAZINE ETHANESULFONIC ACID (three-letter code: EPE) (formula: C<sub>8</sub>H<sub>18</sub>N<sub>2</sub>O<sub>4</sub>S).



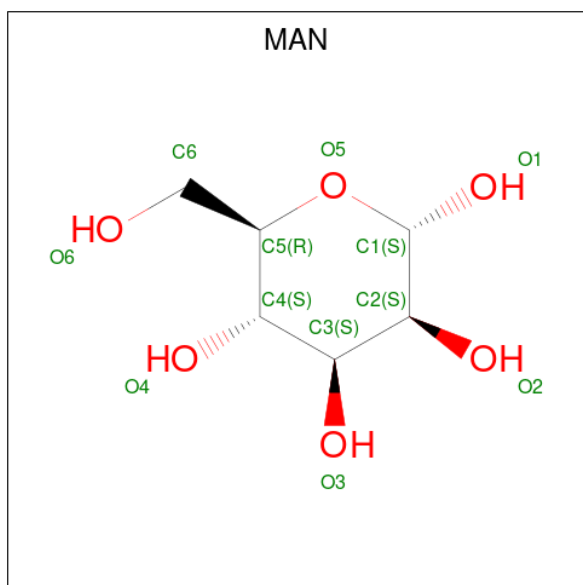
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	B	1	Total C N O S 12 6 2 3 1	0	0
5	C	1	Total C N O S 12 6 2 3 1	0	0
5	F	1	Total C N O S 12 6 2 3 1	0	0

- Molecule 6 is alpha-D-galactopyranose (three-letter code: GLA) (formula: C<sub>6</sub>H<sub>12</sub>O<sub>6</sub>).



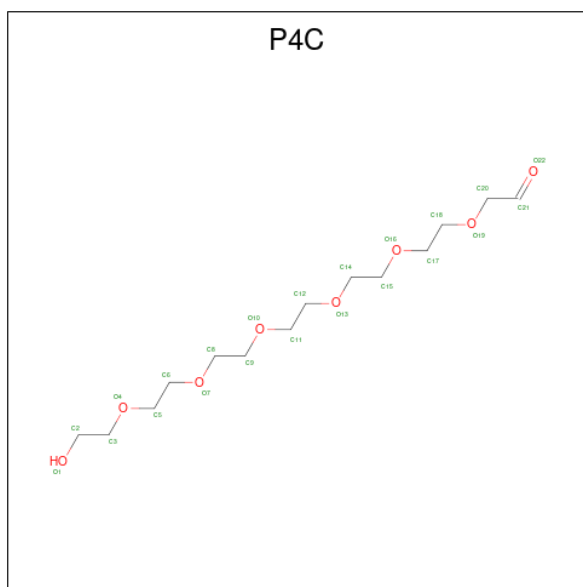
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	B	1	Total C O 12 6 6	0	0
6	C	1	Total C O 12 6 6	0	0
6	E	1	Total C O 12 6 6	0	0
6	F	1	Total C O 12 6 6	0	0

- Molecule 7 is alpha-D-mannopyranose (three-letter code: MAN) (formula: C<sub>6</sub>H<sub>12</sub>O<sub>6</sub>).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
7	B	1	Total	C	O	0	0
			11	6	5		
7	E	1	Total	C	O	0	0
			11	6	5		

- Molecule 8 is O-ACETALDEHYDYL-HEXAETHYLENE GLYCOL (three-letter code: P4C) (formula: C<sub>14</sub>H<sub>28</sub>O<sub>8</sub>).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
8	B	1	Total	C	O	0	0
			22	14	8		
8	C	1	Total	C	O	0	0
			22	14	8		
8	E	1	Total	C	O	0	0
			22	14	8		
8	E	1	Total	C	O	0	0
			22	14	8		
8	F	1	Total	C	O	0	0
			22	14	8		

- Molecule 9 is 2-acetamido-2-deoxy-beta-D-glucopyranose (three-letter code: NAG) (formula: C<sub>8</sub>H<sub>15</sub>NO<sub>6</sub>).





Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
9	C	1	15	8	1	6	0	0
9	F	1	15	8	1	6	0	0

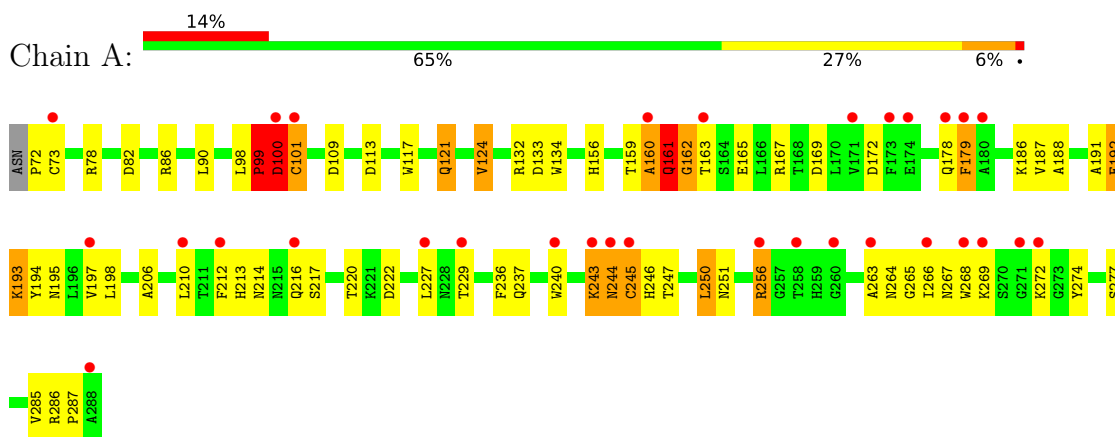
- Molecule 10 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
10	A	29	29	29	0	0
10	B	89	89	89	0	0
10	C	59	59	59	0	0
10	D	32	32	32	0	0
10	E	64	64	64	0	0
10	F	62	62	62	0	0

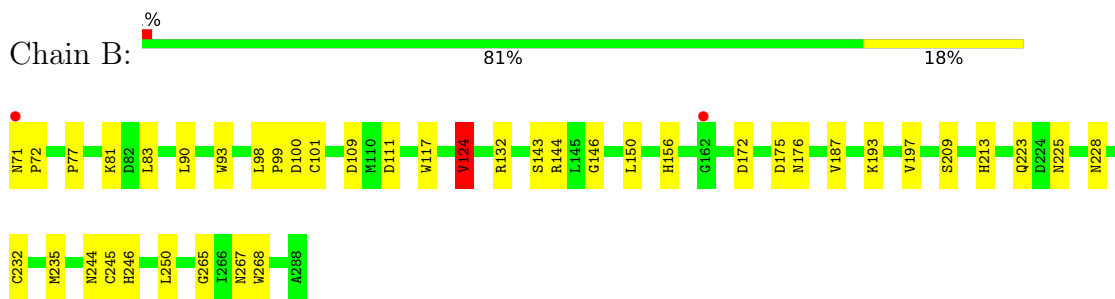
### 3 Residue-property plots [i](#)

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.

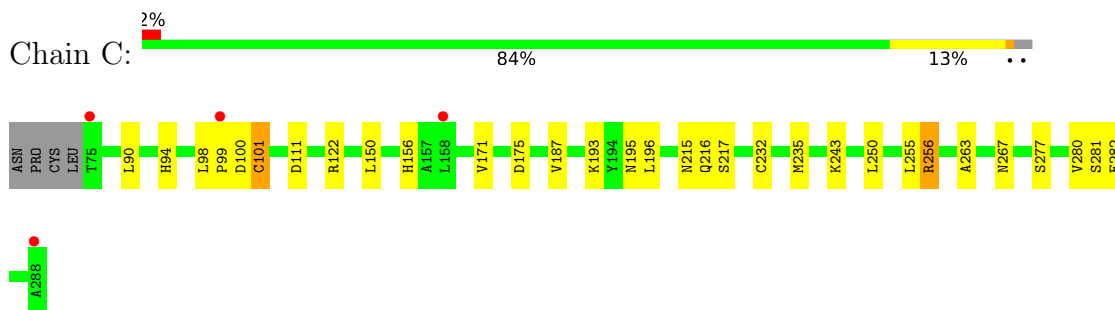
- Molecule 1: FICOLIN-2



- Molecule 1: FICOLIN-2

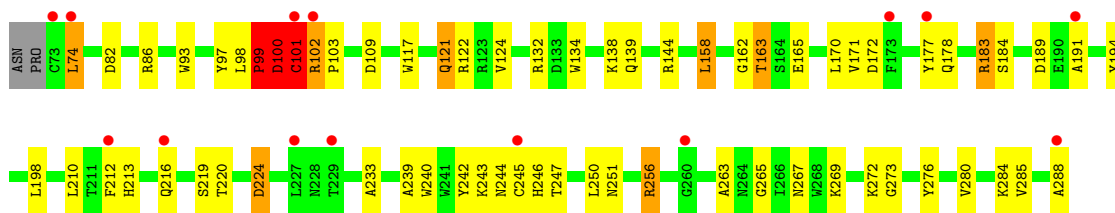


- Molecule 1: FICOLIN-2



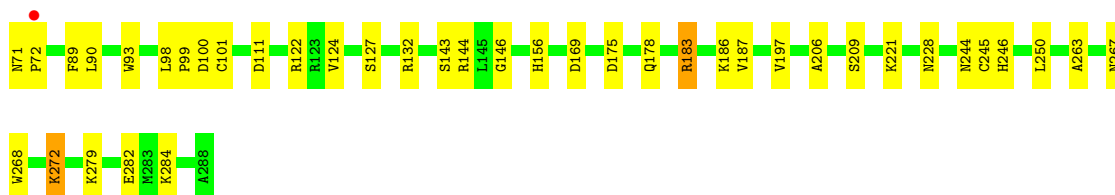
- Molecule 1: FICOLIN-2





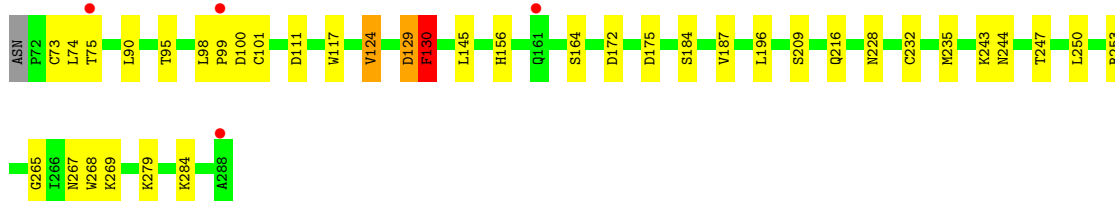
- Molecule 1: FICOLIN-2

Chain E: 82% 17%



- Molecule 1: FICOLIN-2

Chain F: 82% 16%



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

Chain G: 50% 50%



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

Chain H: 100%



## 4 Data and refinement statistics i

Property	Value	Source
Space group	P 32	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	96.08Å 96.08Å 140.98Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	19.95 – 2.15 19.95 – 2.15	Depositor EDS
% Data completeness (in resolution range)	100.0 (19.95-2.15) 99.1 (19.95-2.15)	Depositor EDS
$R_{merge}$	0.06	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.51 (at 2.15Å)	Xtriage
Refinement program	REFMAC 5.2.0019	Depositor
R, $R_{free}$	0.188 , 0.237 0.191 , 0.239	Depositor DCC
$R_{free}$ test set	3923 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	30.9	Xtriage
Anisotropy	0.286	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.35 , 40.3	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	0.029 for -h,-k,l 0.470 for h,-h-k,-l 0.029 for -k,-h,-l	Xtriage
$F_o, F_c$ correlation	0.95	EDS
Total number of atoms	11129	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	38.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.70% 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: MAN, EPE, ACT, P4C, CA, GLA, NAG

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	7/1816 (0.4%)	0.94	10/2455 (0.4%)
1	B	0.44	1/1803 (0.1%)	0.59	1/2439 (0.0%)
1	C	0.40	0/1771	0.59	0/2395
1	D	1.46	2/1785 (0.1%)	0.61	3/2414 (0.1%)
1	E	0.42	0/1800	0.58	0/2436
1	F	0.42	0/1784	0.62	1/2413 (0.0%)
All	All	0.79	10/10759 (0.1%)	0.67	15/14552 (0.1%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	2	5
1	D	2	4
1	F	0	1
All	All	4	10

The worst 5 of 10 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	D	74	LEU	C-O	57.69	2.33	1.23
1	A	256	ARG	C-O	19.96	1.61	1.23
1	A	100	ASP	CA-CB	-19.80	1.10	1.53
1	D	256	ARG	C-O	16.04	1.53	1.23
1	A	99	PRO	N-CA	-13.59	1.24	1.47

The worst 5 of 15 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	99	PRO	N-CA-CB	22.13	129.86	103.30
1	A	100	ASP	N-CA-CB	14.57	136.84	110.60
1	D	256	ARG	CA-C-O	-12.66	93.51	120.10
1	A	100	ASP	CB-CA-C	12.09	134.58	110.40
1	A	99	PRO	CA-N-CD	-11.60	95.26	111.50

All (4) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
1	A	99	PRO	CA
1	A	100	ASP	CA
1	D	100	ASP	CA
1	D	101	CYS	CA

5 of 10 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	100	ASP	Peptide
1	A	161	GLN	Peptide,Mainchain
1	A	162	GLY	Peptide
1	A	256	ARG	Mainchain
1	D	74	LEU	Mainchain

## 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	1767	0	1636	77	0
1	B	1752	0	1624	38	0
1	C	1721	0	1591	23	0
1	D	1738	0	1608	65	0
1	E	1752	0	1616	43	0
1	F	1736	0	1609	38	0
2	G	28	0	25	0	0
2	H	28	0	25	2	0
3	A	1	0	0	0	0
3	B	1	0	0	0	0
3	C	1	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	D	1	0	0	0	0
3	E	1	0	0	0	0
3	F	1	0	0	0	0
4	B	8	0	6	10	0
4	C	4	0	3	0	0
4	E	4	0	3	14	0
4	F	4	0	3	0	0
5	B	12	0	12	1	0
5	C	12	0	12	0	0
5	F	12	0	12	1	0
6	B	12	0	12	0	0
6	C	12	0	12	1	0
6	E	12	0	12	5	0
6	F	12	0	12	1	0
7	B	11	0	10	0	0
7	E	11	0	10	2	0
8	B	22	0	27	3	0
8	C	22	0	27	1	0
8	E	44	0	54	3	0
8	F	22	0	27	4	0
9	C	15	0	15	1	0
9	F	15	0	15	0	0
10	A	29	0	0	10	0
10	B	89	0	0	3	0
10	C	59	0	0	3	0
10	D	32	0	0	12	0
10	E	64	0	0	0	0
10	F	62	0	0	2	0
All	All	11129	0	10018	287	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 14.

The worst 5 of 287 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:D:101:CYS:CB	1:D:102:ARG:HA	1.24	1.44
1:D:101:CYS:HB3	1:D:102:ARG:CA	1.52	1.36
1:D:101:CYS:CB	1:D:102:ARG:CA	2.15	1.16
1:D:101:CYS:HB2	1:D:102:ARG:HA	1.21	1.13
1:C:255:LEU:O	1:C:277:SER:HB3	1.49	1.13

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	218/218 (100%)	188 (86%)	22 (10%)	8 (4%)	<b>3</b> <b>0</b>
1	B	217/218 (100%)	207 (95%)	8 (4%)	2 (1%)	<b>17</b> <b>11</b>
1	C	213/218 (98%)	201 (94%)	11 (5%)	1 (0%)	<b>29</b> <b>22</b>
1	D	215/218 (99%)	192 (89%)	18 (8%)	5 (2%)	<b>6</b> <b>1</b>
1	E	217/218 (100%)	204 (94%)	11 (5%)	2 (1%)	<b>17</b> <b>11</b>
1	F	215/218 (99%)	202 (94%)	12 (6%)	1 (0%)	<b>29</b> <b>22</b>
All	All	1295/1308 (99%)	1194 (92%)	82 (6%)	19 (2%)	<b>10</b> <b>5</b>

5 of 19 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	192	GLU
1	A	244	ASN
1	A	245	CYS
1	D	100	ASP
1	D	178	GLN

### 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	185/183 (101%)	172 (93%)	13 (7%)	<b>15</b> <b>10</b>

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	B	184/183 (100%)	180 (98%)	4 (2%)	52	55
1	C	180/183 (98%)	174 (97%)	6 (3%)	38	37
1	D	182/183 (100%)	172 (94%)	10 (6%)	21	17
1	E	184/183 (100%)	180 (98%)	4 (2%)	52	55
1	F	182/183 (100%)	176 (97%)	6 (3%)	38	37
All	All	1097/1098 (100%)	1054 (96%)	43 (4%)	33	30

5 of 43 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	D	158	LEU
1	E	250	LEU
1	D	163	THR
1	D	224	ASP
1	F	90	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 31 such sidechains are listed below:

Mol	Chain	Res	Type
1	C	195	ASN
1	F	156	HIS
1	D	156	HIS
1	F	216	GLN
1	E	246	HIS

### 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](#)

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
2	NAG	G	1	1,2	14,14,15	0.59	0	17,19,21	1.15	2 (11%)
2	NAG	G	2	2	14,14,15	0.39	0	17,19,21	0.94	0
2	NAG	H	1	1,2	14,14,15	0.69	0	17,19,21	1.11	2 (11%)
2	NAG	H	2	2	14,14,15	0.54	0	17,19,21	0.86	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
2	NAG	G	1	1,2	-	0/6/23/26	0/1/1/1
2	NAG	G	2	2	-	0/6/23/26	0/1/1/1
2	NAG	H	1	1,2	-	0/6/23/26	0/1/1/1
2	NAG	H	2	2	-	0/6/23/26	0/1/1/1

There are no bond length outliers.

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	H	1	NAG	C3-C4-C5	-2.91	105.05	110.24
2	G	1	NAG	C3-C4-C5	-2.70	105.42	110.24
2	G	1	NAG	O5-C1-C2	-2.58	107.22	111.29
2	H	1	NAG	O5-C1-C2	-2.07	108.01	111.29

There are no chirality outliers.

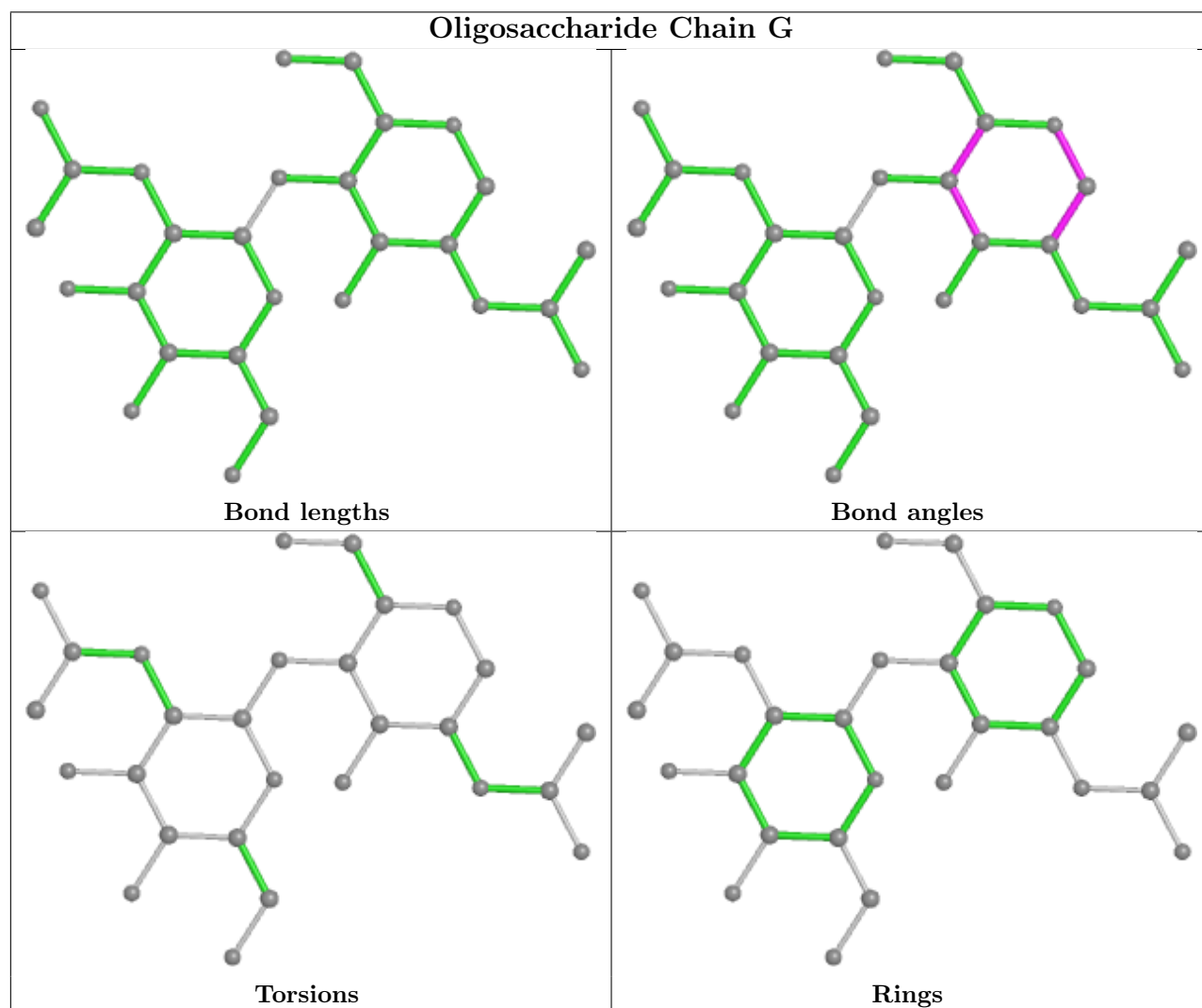
There are no torsion outliers.

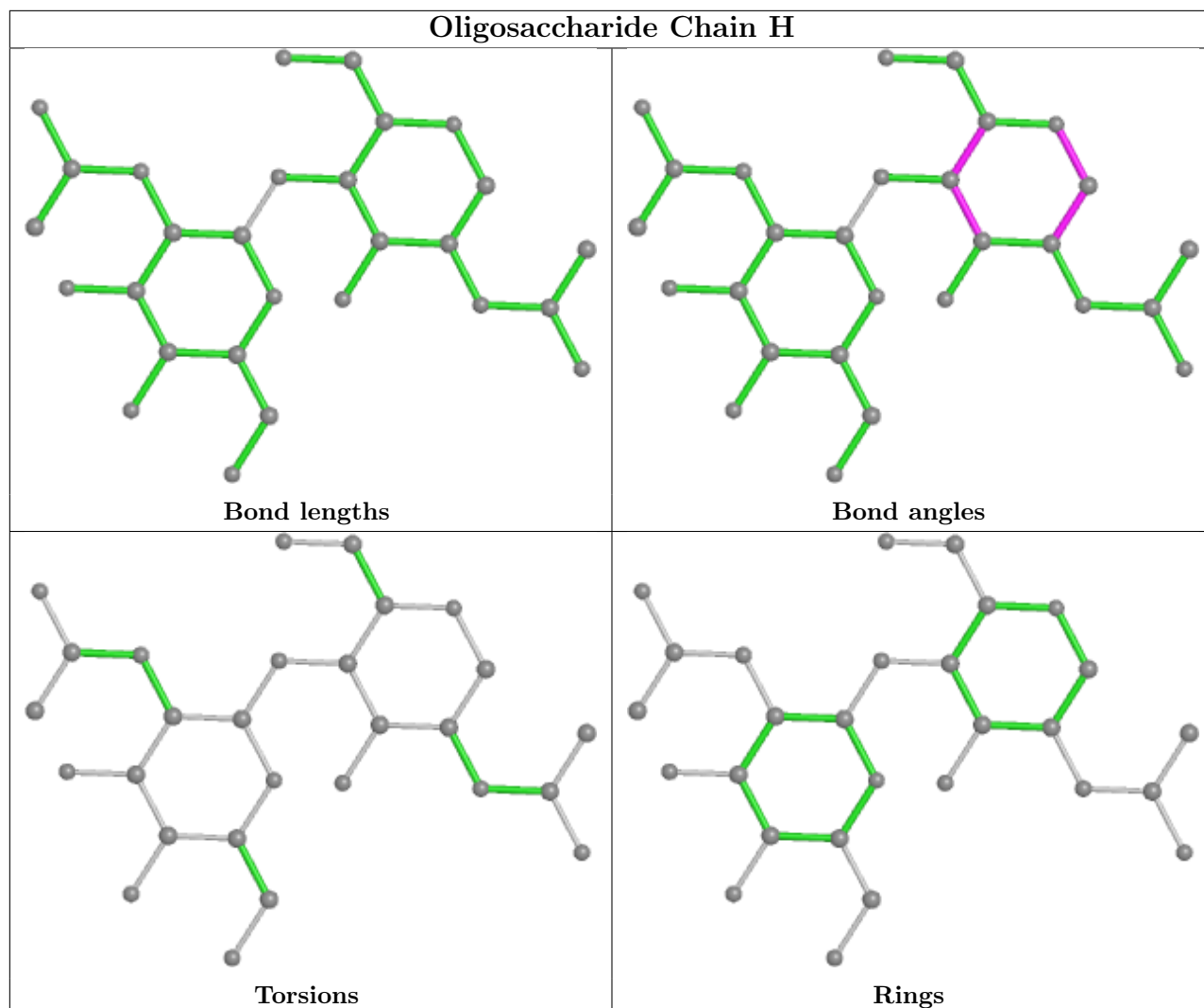
There are no ring outliers.

1 monomer is involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	H	2	NAG	2	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 27 ligands modelled in this entry, 6 are monoatomic - leaving 21 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$
6	GLA	C	1290	-	12,12,12	0.54	0	17,17,17	0.54	0
5	EPE	F	1289	-	12,12,15	1.00	1 (8%)	14,16,20	1.46	2 (14%)
4	ACT	B	1290	-	3,3,3	0.80	0	3,3,3	0.93	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
4	ACT	F	1291	-	3,3,3	0.74	0	3,3,3	1.43	0
9	NAG	C	1293	-	15,15,15	0.47	0	21,21,21	0.72	0
6	GLA	E	1289	-	12,12,12	0.77	0	17,17,17	1.51	3 (17%)
8	P4C	E	1295	-	21,21,21	1.34	2 (9%)	20,20,20	1.28	1 (5%)
9	NAG	F	1293	-	15,15,15	0.52	0	21,21,21	0.98	1 (4%)
4	ACT	E	1290	-	3,3,3	0.80	0	3,3,3	0.90	0
6	GLA	F	1290	-	12,12,12	0.52	0	17,17,17	0.72	0
7	MAN	E	1294	-	11,11,12	0.61	0	15,15,17	1.27	3 (20%)
8	P4C	B	1296	-	21,21,21	1.34	2 (9%)	20,20,20	1.32	1 (5%)
8	P4C	F	1294	-	21,21,21	1.36	2 (9%)	20,20,20	1.29	1 (5%)
7	MAN	B	1295	-	11,11,12	0.57	0	15,15,17	0.76	0
5	EPE	B	1289	-	12,12,15	1.11	1 (8%)	14,16,20	1.60	2 (14%)
4	ACT	C	1291	-	3,3,3	0.79	0	3,3,3	1.19	0
4	ACT	B	407	-	3,3,3	0.79	0	3,3,3	1.23	0
6	GLA	B	1291	-	12,12,12	0.68	0	17,17,17	0.83	0
5	EPE	C	1289	-	12,12,15	1.16	1 (8%)	14,16,20	1.37	2 (14%)
8	P4C	E	1296	-	21,21,21	1.37	2 (9%)	20,20,20	1.24	1 (5%)
8	P4C	C	1294	-	21,21,21	1.36	2 (9%)	20,20,20	1.27	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
9	NAG	F	1293	-	-	6/6/26/26	0/1/1/1
6	GLA	C	1290	-	-	1/2/22/22	0/1/1/1
6	GLA	B	1291	-	-	1/2/22/22	0/1/1/1
8	P4C	E	1296	-	-	12/18/19/19	-
6	GLA	F	1290	-	-	1/2/22/22	0/1/1/1
8	P4C	F	1294	-	-	14/18/19/19	-
5	EPE	F	1289	-	-	0/6/14/19	0/1/1/1
5	EPE	C	1289	-	-	1/6/14/19	0/1/1/1
7	MAN	B	1295	-	-	2/2/19/22	0/1/1/1
7	MAN	E	1294	-	-	2/2/19/22	0/1/1/1
9	NAG	C	1293	-	-	3/6/26/26	0/1/1/1
8	P4C	B	1296	-	-	13/18/19/19	-
6	GLA	E	1289	-	-	2/2/22/22	0/1/1/1

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
5	EPE	B	1289	-	-	5/6/14/19	0/1/1/1
8	P4C	E	1295	-	-	8/18/19/19	-
8	P4C	C	1294	-	-	9/18/19/19	-

The worst 5 of 13 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
8	B	1296	P4C	O22-C21	4.31	1.44	1.19
8	E	1295	P4C	O22-C21	4.29	1.44	1.19
8	E	1296	P4C	O22-C21	4.28	1.44	1.19
8	C	1294	P4C	O22-C21	4.28	1.44	1.19
8	F	1294	P4C	O22-C21	4.28	1.44	1.19

The worst 5 of 18 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
8	B	1296	P4C	O22-C21-C20	-5.55	109.63	126.39
8	F	1294	P4C	O22-C21-C20	-5.49	109.82	126.39
8	C	1294	P4C	O22-C21-C20	-5.39	110.13	126.39
8	E	1295	P4C	O22-C21-C20	-5.28	110.45	126.39
8	E	1296	P4C	O22-C21-C20	-5.21	110.64	126.39

There are no chirality outliers.

5 of 80 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	B	1289	EPE	C10-C9-N1-C6
5	C	1289	EPE	C10-C9-N1-C6
9	C	1293	NAG	C3-C2-N2-C7
9	C	1293	NAG	C8-C7-N2-C2
9	C	1293	NAG	O7-C7-N2-C2

There are no ring outliers.

14 monomers are involved in 47 short contacts:

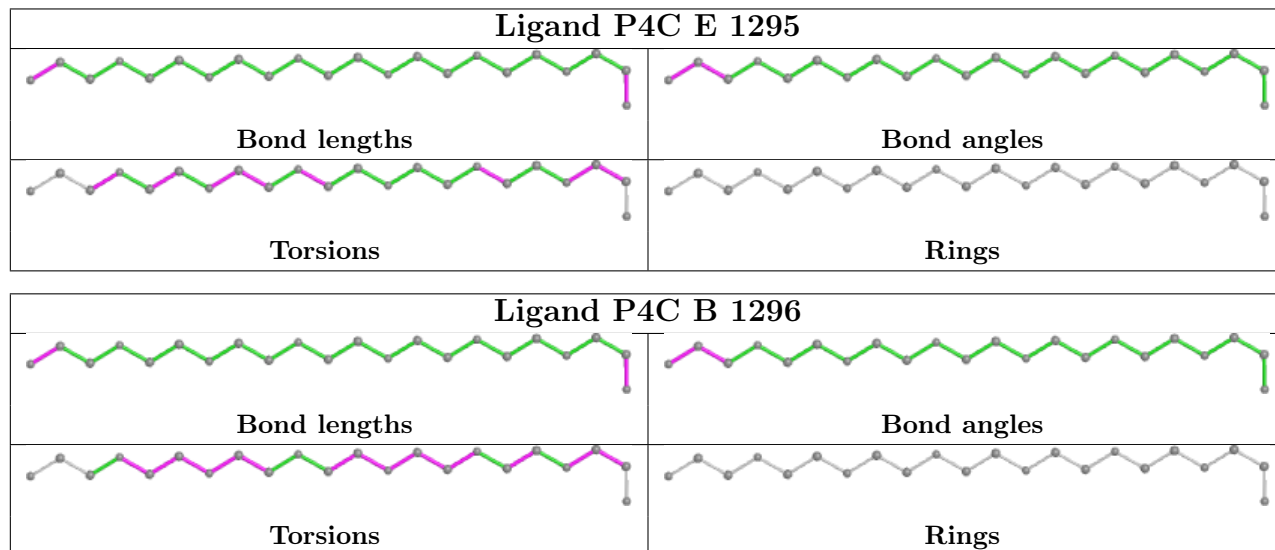
Mol	Chain	Res	Type	Clashes	Symm-Clashes
6	C	1290	GLA	1	0
5	F	1289	EPE	1	0
4	B	1290	ACT	10	0
9	C	1293	NAG	1	0

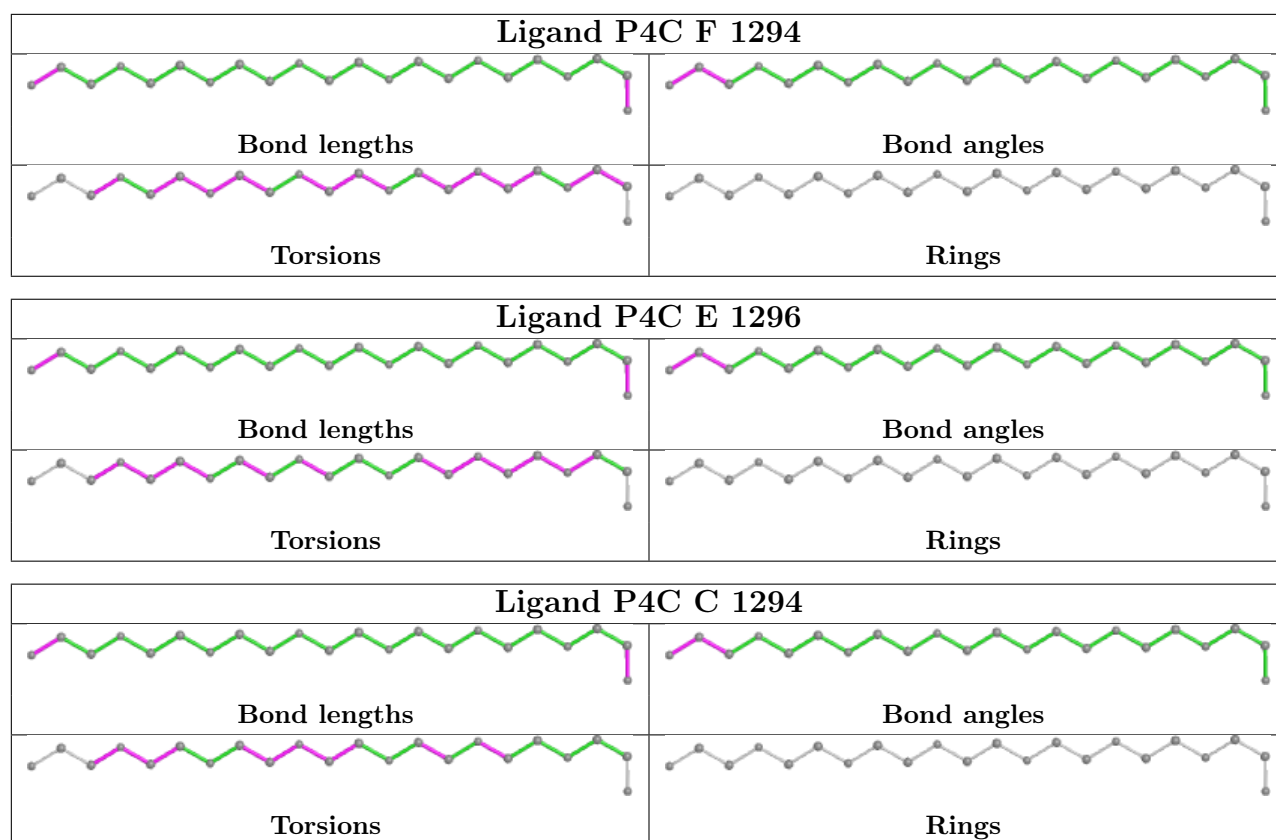
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Mol	Chain	Res	Type	Clashes	Symm-Clashes
6	E	1289	GLA	5	0
8	E	1295	P4C	2	0
4	E	1290	ACT	14	0
6	F	1290	GLA	1	0
7	E	1294	MAN	2	0
8	B	1296	P4C	3	0
8	F	1294	P4C	4	0
5	B	1289	EPE	1	0
8	E	1296	P4C	1	0
8	C	1294	P4C	1	0

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	217/218 (99%)	0.82	31 (14%) 2 3	28, 38, 45, 52	0
1	B	218/218 (100%)	-0.34	2 (0%) 84 88	34, 38, 44, 53	2 (0%)
1	C	214/218 (98%)	-0.27	4 (1%) 66 74	32, 38, 45, 51	1 (0%)
1	D	216/218 (99%)	0.42	14 (6%) 18 25	28, 38, 45, 58	1 (0%)
1	E	218/218 (100%)	-0.34	1 (0%) 91 93	32, 38, 45, 53	0
1	F	217/218 (99%)	-0.21	4 (1%) 68 75	32, 38, 46, 63	0
All	All	1300/1308 (99%)	0.01	56 (4%) 35 45	28, 38, 45, 63	4 (0%)

The worst 5 of 56 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	216	GLN	5.9
1	A	212[A]	PHE	5.7
1	D	212	PHE	5.7
1	A	271	GLY	5.4
1	A	179	PHE	5.0

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

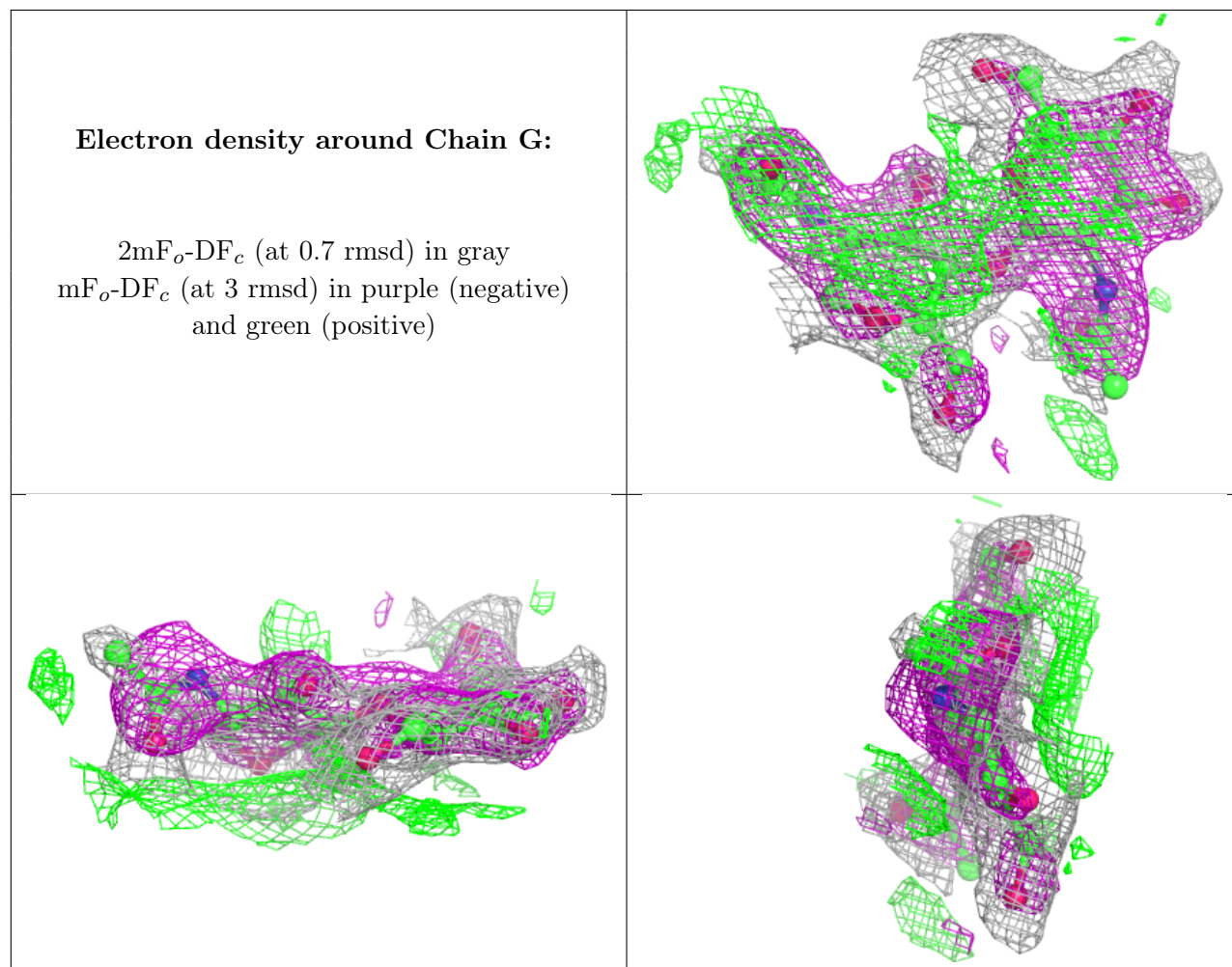
There are no non-standard protein/DNA/RNA residues in this entry.

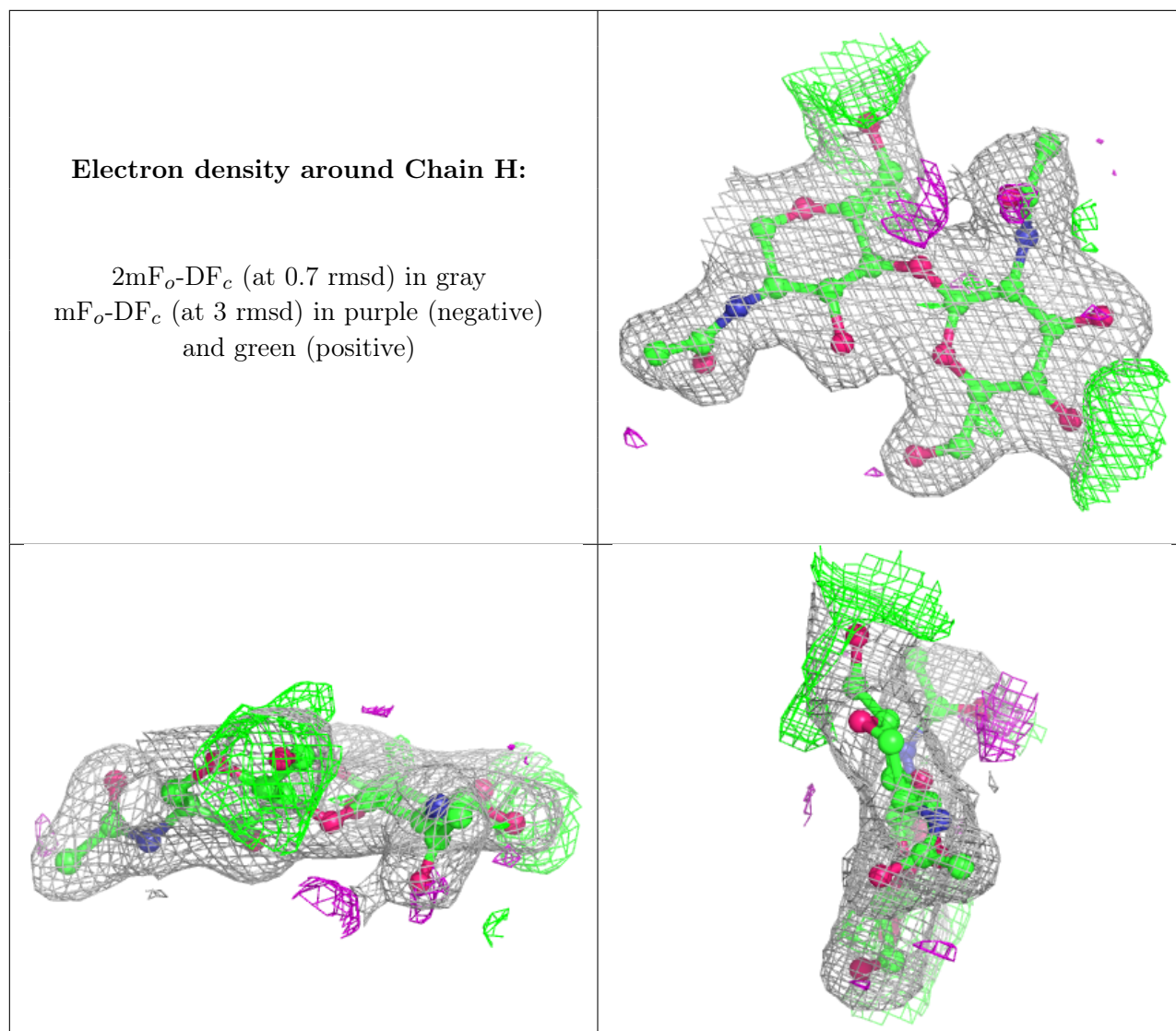
### 6.3 Carbohydrates [i](#)

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( $\text{\AA}^2$ )	Q<0.9
2	NAG	G	1	14/15	0.74	0.37	41,43,44,45	0
2	NAG	G	2	14/15	0.77	0.43	44,45,47,47	0
2	NAG	H	2	14/15	0.91	0.13	38,40,42,42	0
2	NAG	H	1	14/15	0.95	0.10	35,36,39,41	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.





## 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
7	MAN	B	1295	11/12	0.62	0.39	82,83,83,83	0
9	NAG	F	1293	15/15	0.62	0.26	67,69,70,70	0
7	MAN	E	1294	11/12	0.69	0.17	59,59,60,60	0
8	P4C	C	1294	22/22	0.77	0.26	62,66,69,70	0
3	CA	A	1289	1/1	0.79	0.23	83,83,83,83	0
6	GLA	E	1289	12/12	0.80	0.28	53,57,59,59	0
9	NAG	C	1293	15/15	0.81	0.20	64,65,66,66	0

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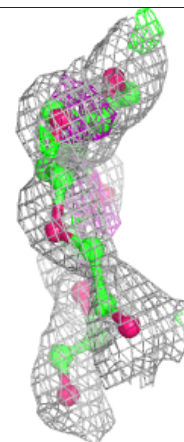
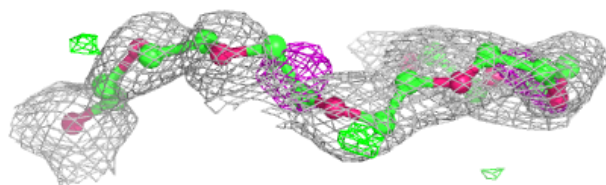
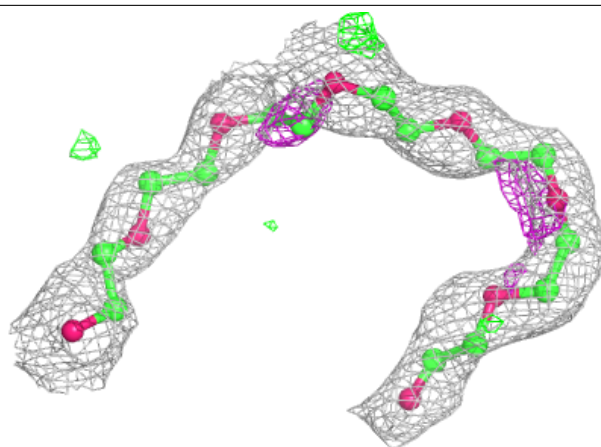
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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
8	P4C	F	1294	22/22	0.85	0.23	59,59,62,62	0
8	P4C	E	1295	22/22	0.86	0.25	50,53,62,62	0
6	GLA	C	1290	12/12	0.86	0.32	52,54,55,55	0
8	P4C	E	1296	22/22	0.87	0.18	50,54,56,57	0
8	P4C	B	1296	22/22	0.87	0.26	47,51,56,57	0
6	GLA	F	1290	12/12	0.88	0.27	51,53,54,55	0
4	ACT	B	407	4/4	0.92	0.11	67,67,67,67	0
5	EPE	C	1289	12/15	0.93	0.26	51,53,53,54	0
6	GLA	B	1291	12/12	0.93	0.17	45,47,47,48	0
5	EPE	F	1289	12/15	0.94	0.24	47,49,51,52	0
4	ACT	F	1291	4/4	0.94	0.21	36,36,37,38	0
4	ACT	B	1290	4/4	0.95	0.22	36,37,37,38	0
4	ACT	E	1290	4/4	0.95	0.13	37,38,38,39	0
3	CA	D	1289	1/1	0.96	0.06	62,62,62,62	0
4	ACT	C	1291	4/4	0.96	0.22	36,36,36,37	0
5	EPE	B	1289	12/15	0.96	0.22	59,64,65,65	0
3	CA	F	1292	1/1	0.98	0.06	40,40,40,40	0
3	CA	B	1292	1/1	0.99	0.06	26,26,26,26	0
3	CA	E	1291	1/1	0.99	0.03	23,23,23,23	0
3	CA	C	1292	1/1	0.99	0.08	42,42,42,42	0

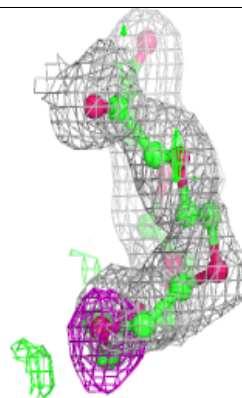
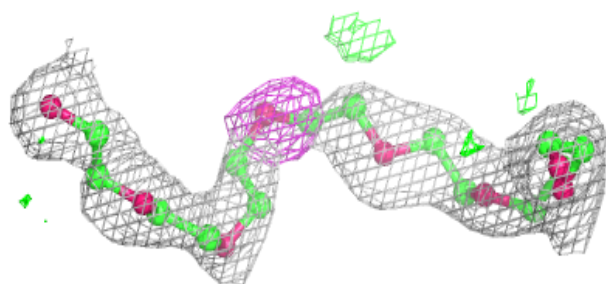
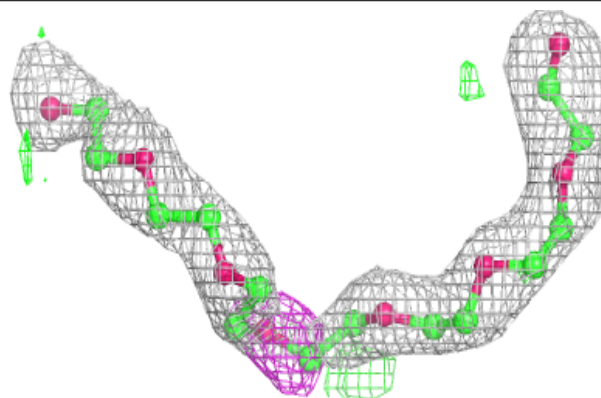
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

**Electron density around P4C C 1294:**

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

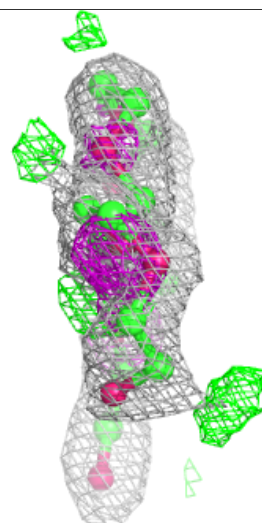
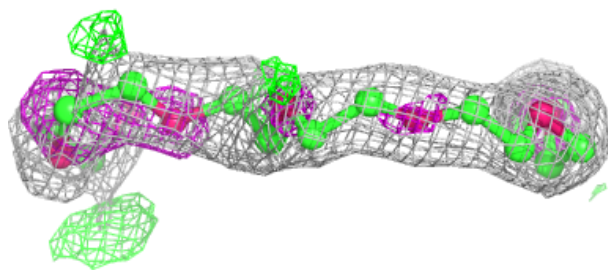
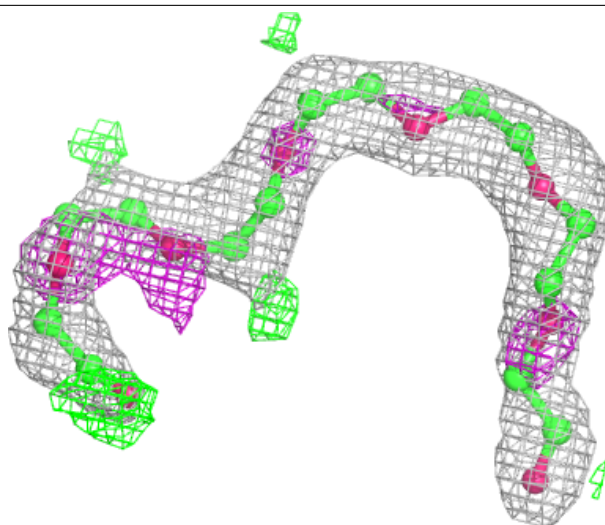
**Electron density around P4C F 1294:**

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



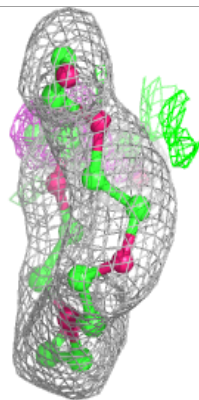
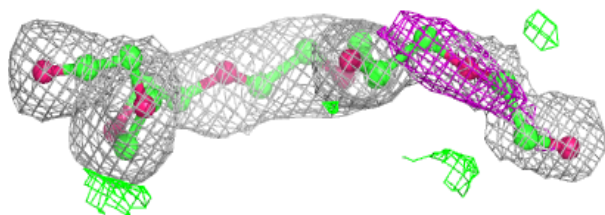
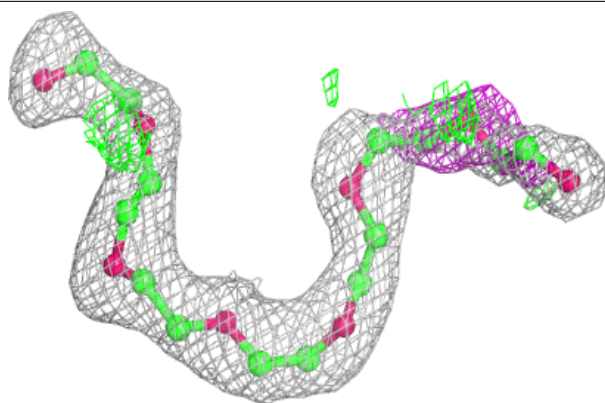
**Electron density around P4C E 1295:**

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

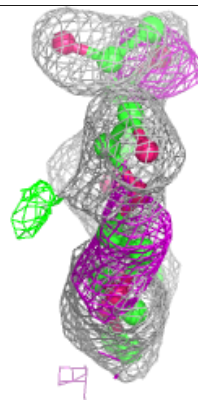
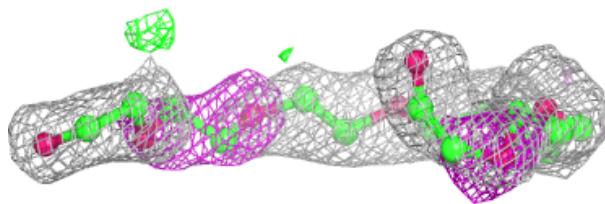
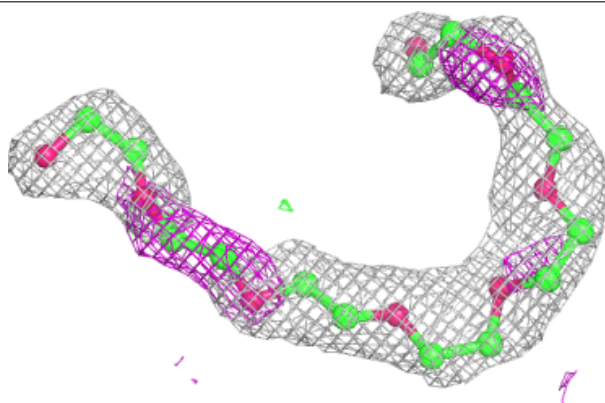


**Electron density around P4C E 1296:**

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

**Electron density around P4C B 1296:**

$2mF_o-DF_c$  (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.