



Full wwPDB X-ray Structure Validation Report ⓘ

Dec 16, 2023 – 10:53 AM EST

PDB ID : 4P02
Title : Structure of Bacterial Cellulose Synthase with cyclic-di-GMP bound.
Authors : Morgan, J.L.W.; McNamara, J.T.; Zimmer, J.
Deposited on : 2014-02-20
Resolution : 2.65 Å(reported)

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

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

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

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

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

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

MolProbity : 4.02b-467
Mogul : 1.8.5 (274361), 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

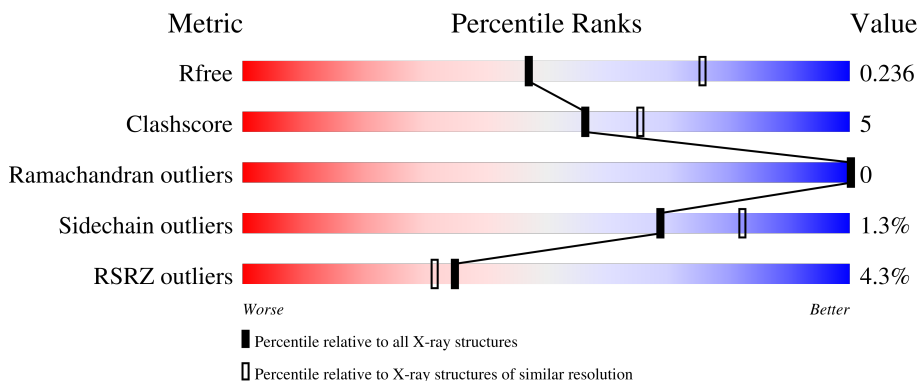
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.65 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	1332 (2.68-2.64)
Clashscore	141614	1374 (2.68-2.64)
Ramachandran outliers	138981	1349 (2.68-2.64)
Sidechain outliers	138945	1349 (2.68-2.64)
RSRZ outliers	127900	1318 (2.68-2.64)

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

Mol	Chain	Length	Quality of chain
1	A	803	 5% 79% 11% 9%
2	B	724	 3% 79% 12% 10%
3	D	9	 100%
4	C	17	 18% 53% 29%

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
4	BGC	C	1	-	-	-	X
4	BGC	C	4	-	-	X	-
4	BGC	C	5	-	-	X	-

2 Entry composition

There are 8 unique types of molecules in this entry. The entry contains 11040 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 Cellulose Synthase subunit A.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	728	5739	3725	1000	982	32	0	1	0

There are 16 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	0	MET	-	expression tag	UNP Q3J125
A	1	GLY	-	expression tag	UNP Q3J125
A	789	HIS	-	expression tag	UNP Q3J125
A	790	HIS	-	expression tag	UNP Q3J125
A	791	HIS	-	expression tag	UNP Q3J125
A	792	HIS	-	expression tag	UNP Q3J125
A	793	HIS	-	expression tag	UNP Q3J125
A	794	HIS	-	expression tag	UNP Q3J125
A	795	LYS	-	expression tag	UNP Q3J125
A	796	LEU	-	expression tag	UNP Q3J125
A	797	HIS	-	expression tag	UNP Q3J125
A	798	HIS	-	expression tag	UNP Q3J125
A	799	HIS	-	expression tag	UNP Q3J125
A	800	HIS	-	expression tag	UNP Q3J125
A	801	HIS	-	expression tag	UNP Q3J125
A	802	HIS	-	expression tag	UNP Q3J125

- Molecule 2 is a protein called Cellulose Synthase subunit B.

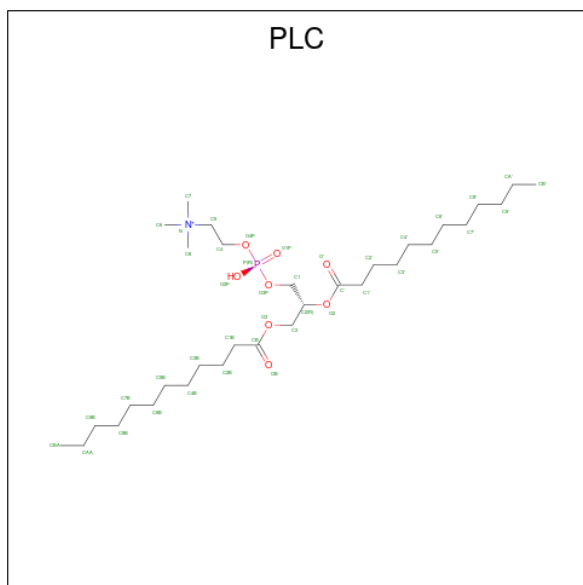
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	655	4887	3100	864	907	16	0	0	0

- Molecule 3 is a protein called unidentified peptide.

Continued from previous page...

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	P		
5	A	1	46	20	10	14	2	0	0

- Molecule 6 is DIUNDECYL PHOSPHATIDYL CHOLINE (three-letter code: PLC) (formula: $C_{32}H_{65}NO_8P$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	P		
6	A	1	38	28	1	8	1	0	0
6	B	1	Total	C				0	0
			11	11					
6	B	1	Total	C				0	0
			9	9					
6	B	1	Total	C				0	0
			11	11					

- Molecule 7 is 1,2-Distearoyl-sn-glycerophosphoethanolamine (three-letter code: 3PE) (formula: $C_{41}H_{82}NO_8P$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	P		
7	A	1	20	10	1	8	1	0	0

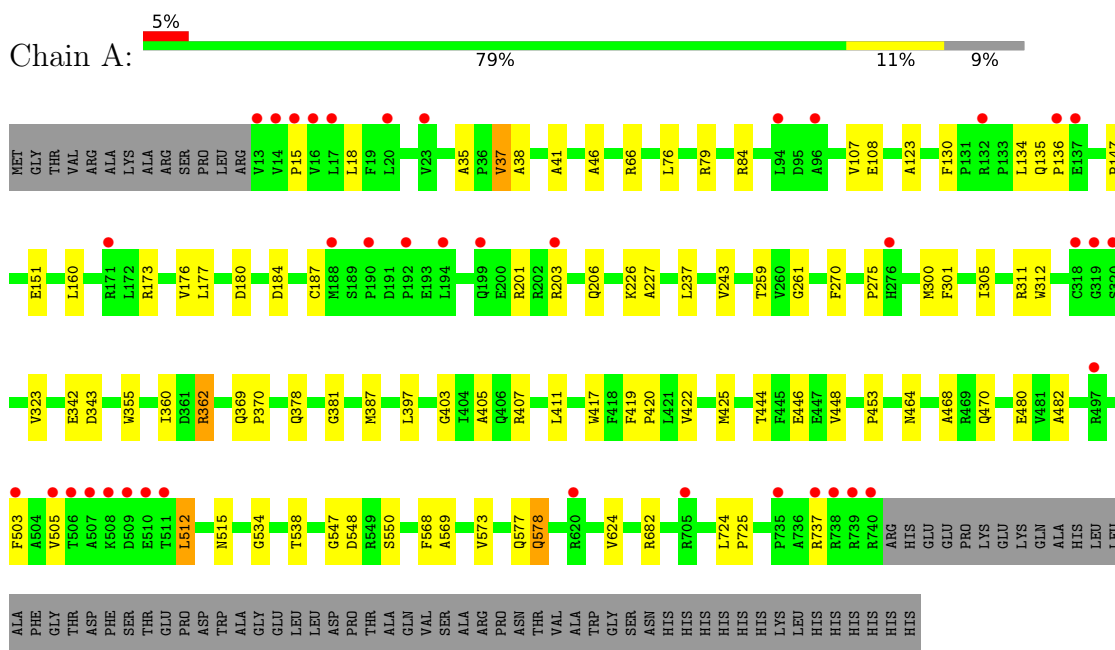
- Molecule 8 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	Mg		
8	B	1	1	1	0	0

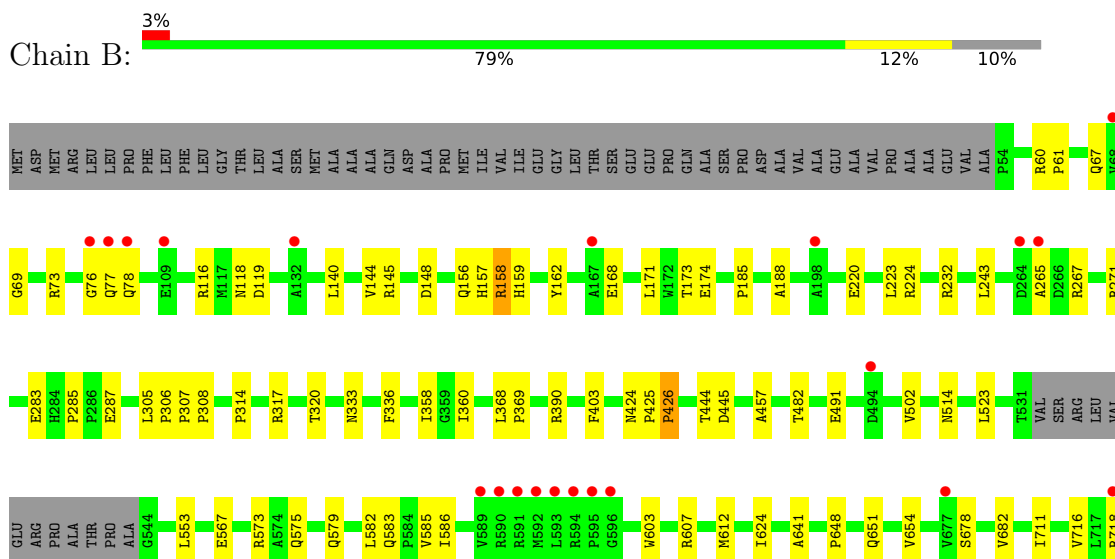
3 Residue-property plots

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: Cellulose Synthase subunit A



• Molecule 2: Cellulose Synthase subunit B



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	67.64Å 214.66Å 220.40Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	19.99 – 2.65 34.75 – 2.65	Depositor EDS
% Data completeness (in resolution range)	91.4 (19.99-2.65) 91.4 (34.75-2.65)	Depositor EDS
R_{merge}	0.11	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.17 (at 2.65Å)	Xtrriage
Refinement program	PHENIX (phenix.refine: 1.8.4_1496)	Depositor
R, R_{free}	0.199 , 0.230 0.211 , 0.236	Depositor DCC
R_{free} test set	4314 reflections (5.01%)	wwPDB-VP
Wilson B-factor (Å ²)	59.5	Xtrriage
Anisotropy	0.347	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 59.0	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	0.013 for -h,l,k	Xtrriage
F_o, F_c correlation	0.93	EDS
Total number of atoms	11040	wwPDB-VP
Average B, all atoms (Å ²)	70.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.76% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

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

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: MG, C2E, PLC, 3PE, BGC

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	0.22	0/5888	0.39	0/8007
2	B	0.21	0/5006	0.41	0/6865
All	All	0.21	0/10894	0.40	0/14872

There are no bond length outliers.

There are no bond angle outliers.

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	5739	0	5855	52	0
2	B	4887	0	4966	55	0
3	D	45	0	12	0	0
4	C	187	0	154	17	0
5	A	92	0	44	0	0
6	A	38	0	53	0	0
6	B	31	0	56	0	0
7	A	20	0	14	0	0
8	B	1	0	0	0	0
All	All	11040	0	11154	111	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 5.

All (111) 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)
4:C:4:BGC:O3	4:C:5:BGC:O5	1.85	0.94
4:C:5:BGC:O3	4:C:6:BGC:O5	1.90	0.88
4:C:4:BGC:HC	4:C:5:BGC:C5	1.86	0.88
2:B:390:ARG:NH2	4:C:5:BGC:O6	2.07	0.84
4:C:1:BGC:H6C1	4:C:2:BGC:O2	1.78	0.84
1:A:243:VAL:HG22	1:A:323:VAL:HG22	1.66	0.77
2:B:567:GLU:HG3	4:C:7:BGC:H6C2	1.68	0.75
1:A:84:ARG:NH1	1:A:108:GLU:OE1	2.31	0.64
4:C:4:BGC:C3	4:C:5:BGC:O5	2.46	0.63
1:A:480:GLU:OE2	4:C:14:BGC:O6	2.17	0.63
4:C:5:BGC:C3	4:C:6:BGC:O5	2.48	0.62
1:A:419:PHE:HA	1:A:422:VAL:HG22	1.83	0.61
2:B:148:ASP:HB3	2:B:305:LEU:HG	1.81	0.61
2:B:77:GLN:NE2	2:B:333:ASN:OD1	2.36	0.58
2:B:185:PRO:HG2	2:B:188:ALA:HB2	1.85	0.58
2:B:232:ARG:NH1	2:B:491:GLU:OE2	2.37	0.58
2:B:265:ALA:HB3	2:B:267:ARG:HH21	1.67	0.58
2:B:158:ARG:HH22	2:B:333:ASN:HA	1.69	0.57
1:A:550:SER:HB3	2:B:567:GLU:HB3	1.85	0.57
1:A:259:THR:HG21	1:A:323:VAL:HG21	1.85	0.57
1:A:66:ARG:NH1	1:A:123:ALA:O	2.37	0.57
1:A:130:PHE:HZ	1:A:362:ARG:HG3	1.70	0.57
4:C:4:BGC:HC	4:C:5:BGC:C6	2.17	0.57
1:A:446:GLU:OE2	2:B:573:ARG:NH2	2.33	0.56
2:B:220:GLU:OE2	2:B:224:ARG:NH2	2.39	0.56
1:A:227:ALA:HB2	1:A:342:GLU:HG3	1.88	0.56
1:A:312:TRP:HB3	1:A:405:ALA:HB1	1.86	0.56
1:A:184:ASP:HA	1:A:187:CYS:HB2	1.88	0.55
4:C:5:BGC:O6	4:C:5:BGC:O4	2.26	0.54
2:B:360:ILE:HA	2:B:444:THR:HG23	1.90	0.53
1:A:311:ARG:NH2	2:B:716:VAL:O	2.41	0.53
2:B:482:THR:HG22	2:B:502:VAL:HB	1.91	0.53
2:B:457:ALA:O	2:B:651:GLN:NE2	2.43	0.52
2:B:583:GLN:HA	2:B:586:ILE:HG12	1.91	0.52
1:A:301:PHE:HA	1:A:305:ILE:HB	1.92	0.52
1:A:176:VAL:HG21	1:A:237:LEU:HD11	1.92	0.52
1:A:135:GLN:HG3	1:A:136:PRO:HD2	1.92	0.51
1:A:160:LEU:HD11	1:A:177:LEU:HD12	1.92	0.51

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:311:ARG:HH22	2:B:719:THR:HG23	1.75	0.51
2:B:76:GLY:HA2	2:B:168:GLU:O	2.11	0.51
1:A:547:GLY:HA3	4:C:6:BGC:H2	1.93	0.51
2:B:77:GLN:HG3	2:B:157:HIS:H	1.76	0.51
1:A:419:PHE:CD2	1:A:420:PRO:HD3	2.46	0.50
1:A:482:ALA:HB2	1:A:569:ALA:HB1	1.92	0.50
2:B:67:GLN:NE2	2:B:69:GLY:O	2.37	0.50
2:B:612:MET:HG2	2:B:654:VAL:HG22	1.92	0.49
4:C:4:BGC:O3	4:C:5:BGC:C5	2.55	0.49
2:B:116:ARG:NH1	2:B:119:ASP:OD1	2.46	0.49
1:A:512:LEU:HB2	1:A:578:GLN:O	2.13	0.48
1:A:515:ASN:OD1	1:A:577:GLN:N	2.43	0.48
1:A:37:VAL:HG13	1:A:41:ALA:HB3	1.95	0.48
2:B:641:ALA:HB1	2:B:648:PRO:HD2	1.95	0.48
1:A:203:ARG:HA	1:A:206:GLN:HB2	1.94	0.48
2:B:140:LEU:HB3	2:B:144:VAL:HB	1.96	0.48
1:A:397:LEU:HD21	1:A:411:LEU:HD13	1.96	0.48
2:B:358:ILE:HG13	2:B:403:PHE:HE2	1.77	0.48
1:A:369:GLN:HG3	1:A:370:PRO:HD2	1.97	0.47
2:B:77:GLN:HE21	2:B:156:GLN:HG3	1.80	0.47
2:B:678:SER:O	2:B:682:VAL:HG23	2.15	0.47
2:B:603:TRP:O	2:B:607:ARG:NH1	2.43	0.46
1:A:35:ALA:O	1:A:79:ARG:NH2	2.48	0.46
1:A:378:GLN:HB2	1:A:505:VAL:HB	1.98	0.46
1:A:151:GLU:O	1:A:201:ARG:NH2	2.49	0.45
2:B:77:GLN:HE22	2:B:158:ARG:NH1	2.14	0.45
2:B:523:LEU:HD21	2:B:624:ILE:HG21	1.98	0.45
1:A:300:MET:HA	1:A:470:GLN:HB3	1.98	0.45
2:B:285:PRO:HB3	2:B:287:GLU:OE2	2.17	0.45
2:B:307:PRO:HA	2:B:308:PRO:HD3	1.88	0.44
2:B:320:THR:HA	2:B:445:ASP:HA	2.00	0.44
1:A:275:PRO:HD3	1:A:360:ILE:O	2.18	0.44
2:B:73:ARG:NH1	2:B:174:GLU:OE1	2.51	0.44
2:B:267:ARG:HG2	2:B:283:GLU:HB2	2.00	0.43
2:B:77:GLN:O	2:B:78:GLN:HB3	2.19	0.43
4:C:4:BGC:O3	4:C:5:BGC:C1	2.65	0.43
2:B:314:PRO:HG2	2:B:317:ARG:HD2	2.01	0.43
1:A:682:ARG:HA	1:A:682:ARG:HD2	1.81	0.43
2:B:223:LEU:HD21	2:B:243:LEU:HD21	2.00	0.43
1:A:270:PHE:HB3	1:A:355:TRP:HB3	2.01	0.42
1:A:403:GLY:O	1:A:407:ARG:HG3	2.18	0.42

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:38:ALA:HB3	2:B:553:LEU:HD23	2.01	0.42
1:A:534:GLY:O	1:A:538:THR:HG23	2.20	0.42
4:C:2:BGC:O3	4:C:3:BGC:O5	2.32	0.42
1:A:15:PRO:HD3	2:B:718:ARG:HE	1.84	0.42
1:A:107:VAL:HG21	1:A:425[A]:MET:HG2	2.02	0.42
2:B:60:ARG:HA	2:B:61:PRO:HD2	1.89	0.42
2:B:579:GLN:O	2:B:583:GLN:HG3	2.20	0.42
1:A:343:ASP:OD1	1:A:343:ASP:N	2.53	0.42
2:B:575:GLN:HE21	2:B:575:GLN:HB3	1.63	0.42
2:B:76:GLY:N	2:B:171:LEU:O	2.37	0.42
1:A:147:PRO:HG3	1:A:226:LYS:HE3	2.02	0.41
1:A:448:VAL:O	1:A:453:PRO:HD3	2.19	0.41
2:B:118:ASN:ND2	2:B:145:ARG:HG3	2.35	0.41
1:A:548:ASP:OD1	4:C:7:BGC:O6	2.36	0.41
2:B:306:PRO:HA	2:B:307:PRO:HD3	1.96	0.41
2:B:368:LEU:HA	2:B:369:PRO:HD3	1.89	0.41
1:A:46:ALA:HA	1:A:76:LEU:HD11	2.01	0.41
1:A:464:ASN:O	1:A:468:ALA:HB2	2.20	0.41
2:B:78:GLN:HB2	2:B:333:ASN:ND2	2.36	0.41
1:A:378:GLN:HA	1:A:503:PHE:HE2	1.86	0.41
1:A:724:LEU:HB2	1:A:725:PRO:HD3	2.02	0.41
2:B:424:ASN:HA	2:B:425:PRO:HA	1.90	0.41
2:B:78:GLN:HG3	2:B:336:PHE:CD1	2.55	0.41
2:B:582:LEU:O	2:B:585:VAL:HB	2.21	0.41
1:A:387:MET:HG3	1:A:417:TRP:CD1	2.56	0.41
2:B:159:HIS:HB3	2:B:162:TYR:O	2.21	0.41
1:A:18:LEU:HD22	2:B:711:ILE:HG23	2.02	0.41
1:A:134:LEU:HD11	1:A:261:GLY:HA2	2.03	0.41
1:A:381:GLY:HA3	1:A:503:PHE:CE2	2.56	0.40
1:A:547:GLY:O	4:C:7:BGC:O6	2.40	0.40
2:B:157:HIS:CE1	2:B:173:THR:HG22	2.56	0.40
2:B:425:PRO:HA	2:B:426:PRO:HD3	1.93	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	727/803 (90%)	706 (97%)	21 (3%)	0	100	100
2	B	651/724 (90%)	635 (98%)	16 (2%)	0	100	100
All	All	1378/1527 (90%)	1341 (97%)	37 (3%)	0	100	100

There are no Ramachandran outliers to report.

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	599/661 (91%)	588 (98%)	11 (2%)	59	75
2	B	520/572 (91%)	516 (99%)	4 (1%)	81	89
All	All	1119/1233 (91%)	1104 (99%)	15 (1%)	69	82

All (15) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	37	VAL
1	A	173	ARG
1	A	180	ASP
1	A	362	ARG
1	A	444	THR
1	A	512	LEU
1	A	568	PHE
1	A	573	VAL
1	A	578	GLN
1	A	624	VAL
1	A	737	ARG
2	B	158	ARG
2	B	271	ARG
2	B	426	PRO

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
2	B	514	ASN

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

Mol	Chain	Res	Type
2	B	77	GLN
2	B	129	GLN

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](#)

17 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	BGC	C	1	4	11,11,12	0.30	0	15,15,17	0.72	0
4	BGC	C	10	4	11,11,12	0.27	0	15,15,17	0.93	1 (6%)
4	BGC	C	11	4	11,11,12	0.30	0	15,15,17	0.71	0
4	BGC	C	12	4	11,11,12	0.29	0	15,15,17	0.89	1 (6%)
4	BGC	C	13	4	11,11,12	0.37	0	15,15,17	0.77	0
4	BGC	C	14	4	11,11,12	0.38	0	15,15,17	1.15	1 (6%)
4	BGC	C	15	4	11,11,12	0.29	0	15,15,17	0.90	1 (6%)
4	BGC	C	16	4	11,11,12	0.35	0	15,15,17	1.11	1 (6%)
4	BGC	C	17	4	11,11,12	0.29	0	15,15,17	0.85	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
4	BGC	C	2	4	11,11,12	0.35	0	15,15,17	0.96	1 (6%)
4	BGC	C	3	4	11,11,12	0.30	0	15,15,17	0.78	0
4	BGC	C	4	4	11,11,12	0.38	0	15,15,17	1.12	1 (6%)
4	BGC	C	5	4	11,11,12	0.52	0	15,15,17	1.81	4 (26%)
4	BGC	C	6	4	11,11,12	0.26	0	15,15,17	1.14	2 (13%)
4	BGC	C	7	4	11,11,12	0.21	0	15,15,17	0.81	0
4	BGC	C	8	4	11,11,12	0.43	0	15,15,17	1.50	3 (20%)
4	BGC	C	9	4	11,11,12	0.30	0	15,15,17	0.79	1 (6%)

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	BGC	C	1	4	-	2/2/19/22	0/1/1/1
4	BGC	C	10	4	-	2/2/19/22	0/1/1/1
4	BGC	C	11	4	-	0/2/19/22	0/1/1/1
4	BGC	C	12	4	-	0/2/19/22	0/1/1/1
4	BGC	C	13	4	-	0/2/19/22	0/1/1/1
4	BGC	C	14	4	-	2/2/19/22	0/1/1/1
4	BGC	C	15	4	-	0/2/19/22	0/1/1/1
4	BGC	C	16	4	-	2/2/19/22	0/1/1/1
4	BGC	C	17	4	-	0/2/19/22	0/1/1/1
4	BGC	C	2	4	-	2/2/19/22	0/1/1/1
4	BGC	C	3	4	-	1/2/19/22	0/1/1/1
4	BGC	C	4	4	-	2/2/19/22	0/1/1/1
4	BGC	C	5	4	-	2/2/19/22	0/1/1/1
4	BGC	C	6	4	-	2/2/19/22	0/1/1/1
4	BGC	C	7	4	-	2/2/19/22	0/1/1/1
4	BGC	C	8	4	-	2/2/19/22	0/1/1/1
4	BGC	C	9	4	-	2/2/19/22	0/1/1/1

There are no bond length outliers.

All (17) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	C	5	BGC	C1-C2-C3	4.43	115.11	109.67

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	C	14	BGC	C1-C2-C3	3.68	114.19	109.67
4	C	4	BGC	C1-C2-C3	3.30	113.73	109.67
4	C	5	BGC	C1-O5-C5	-2.95	108.19	112.19
4	C	8	BGC	C1-C2-C3	2.90	113.23	109.67
4	C	8	BGC	C3-C4-C5	2.86	115.34	110.24
4	C	16	BGC	C1-C2-C3	2.81	113.12	109.67
4	C	10	BGC	C1-C2-C3	2.75	113.04	109.67
4	C	6	BGC	C1-O5-C5	-2.58	108.70	112.19
4	C	8	BGC	C2-C3-C4	2.58	115.35	110.89
4	C	5	BGC	O5-C5-C6	2.43	111.02	107.20
4	C	15	BGC	O5-C1-C2	-2.37	107.11	110.77
4	C	12	BGC	C1-C2-C3	2.28	112.47	109.67
4	C	2	BGC	C1-C2-C3	2.21	112.38	109.67
4	C	6	BGC	O5-C1-C2	-2.19	107.39	110.77
4	C	5	BGC	C2-C3-C4	2.19	114.68	110.89
4	C	9	BGC	C1-C2-C3	2.11	112.26	109.67

There are no chirality outliers.

All (23) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	C	7	BGC	O5-C5-C6-O6
4	C	2	BGC	C4-C5-C6-O6
4	C	4	BGC	O5-C5-C6-O6
4	C	5	BGC	O5-C5-C6-O6
4	C	2	BGC	O5-C5-C6-O6
4	C	6	BGC	O5-C5-C6-O6
4	C	10	BGC	O5-C5-C6-O6
4	C	7	BGC	C4-C5-C6-O6
4	C	1	BGC	O5-C5-C6-O6
4	C	4	BGC	C4-C5-C6-O6
4	C	10	BGC	C4-C5-C6-O6
4	C	1	BGC	C4-C5-C6-O6
4	C	16	BGC	O5-C5-C6-O6
4	C	6	BGC	C4-C5-C6-O6
4	C	8	BGC	C4-C5-C6-O6
4	C	14	BGC	O5-C5-C6-O6
4	C	14	BGC	C4-C5-C6-O6
4	C	5	BGC	C4-C5-C6-O6
4	C	3	BGC	O5-C5-C6-O6
4	C	8	BGC	O5-C5-C6-O6
4	C	9	BGC	C4-C5-C6-O6

Continued on next page...

Continued from previous page...

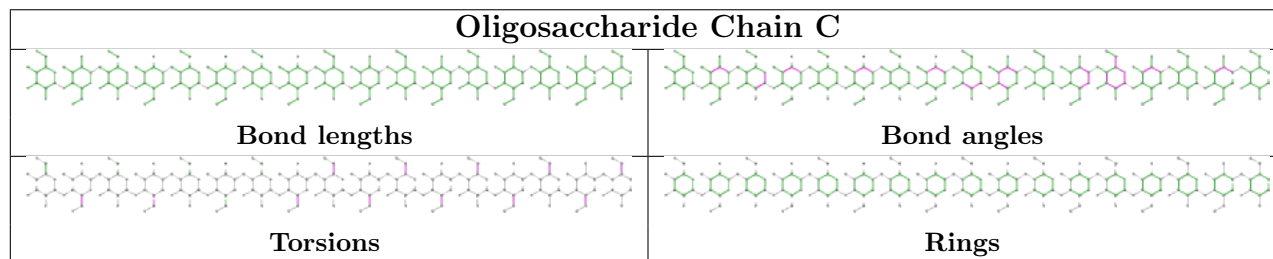
Mol	Chain	Res	Type	Atoms
4	C	9	BGC	O5-C5-C6-O6
4	C	16	BGC	C4-C5-C6-O6

There are no ring outliers.

8 monomers are involved in 17 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	C	5	BGC	10	0
4	C	7	BGC	3	0
4	C	14	BGC	1	0
4	C	2	BGC	2	0
4	C	4	BGC	6	0
4	C	3	BGC	1	0
4	C	1	BGC	1	0
4	C	6	BGC	3	0

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



5.6 Ligand geometry [i](#)

Of 8 ligands modelled in this entry, 1 is monoatomic - leaving 7 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	PLC	B	802	-	10,10,41	0.26	0	9,9,49	0.54	0
5	C2E	A	918	-	44,52,52	0.96	2 (4%)	52,82,82	1.07	5 (9%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
6	PLC	B	804	-	10,10,41	0.25	0	9,9,49	0.54	0
6	PLC	A	920	-	37,37,41	1.12	2 (5%)	43,45,49	1.10	3 (6%)
6	PLC	B	803	-	8,8,41	0.25	0	7,7,49	0.50	0
5	C2E	A	919	-	44,52,52	0.99	2 (4%)	52,82,82	1.04	5 (9%)
7	3PE	A	921	-	19,19,50	1.60	2 (10%)	22,24,55	1.65	3 (13%)

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	PLC	B	802	-	-	1/8/8/45	-
5	C2E	A	918	-	-	2/22/62/62	0/6/7/7
6	PLC	B	804	-	-	5/8/8/45	-
6	PLC	A	920	-	-	22/41/41/45	-
6	PLC	B	803	-	-	2/6/6/45	-
5	C2E	A	919	-	-	0/22/62/62	0/6/7/7
7	3PE	A	921	-	-	6/22/22/54	-

All (8) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
7	A	921	3PE	O21-C21	4.80	1.46	1.35
7	A	921	3PE	O31-C31	4.37	1.46	1.33
6	A	920	PLC	O3-CB	4.28	1.45	1.33
6	A	920	PLC	O2-C'	4.20	1.46	1.34
5	A	919	C2E	C6-N1	-2.33	1.34	1.37
5	A	918	C2E	C6-N1	-2.33	1.34	1.37
5	A	919	C2E	C61-N11	-2.32	1.34	1.37
5	A	918	C2E	C61-N11	-2.28	1.34	1.37

All (16) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
7	A	921	3PE	O21-C21-C22	5.14	120.54	111.09
6	A	920	PLC	O2-C'-C1'	4.21	120.57	111.50
7	A	921	3PE	O31-C31-C32	3.42	120.36	111.38
7	A	921	3PE	C2-O21-C21	-2.82	112.65	117.90
6	A	920	PLC	O3-CB-C1B	2.64	120.20	111.91

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	A	918	C2E	C81-N71-C51	2.58	107.90	102.99
5	A	918	C2E	C8-N7-C5	2.56	107.87	102.99
5	A	919	C2E	C8-N7-C5	2.56	107.86	102.99
5	A	919	C2E	C81-N71-C51	2.55	107.85	102.99
5	A	918	C2E	C3'-C2'-C1'	2.46	105.34	99.89
5	A	918	C2E	C5-C6-N1	2.39	118.17	113.95
5	A	918	C2E	C51-C61-N11	2.39	118.17	113.95
5	A	919	C2E	C51-C61-N11	2.38	118.15	113.95
5	A	919	C2E	C5-C6-N1	2.30	118.02	113.95
5	A	919	C2E	C3'-C2'-C1'	2.19	104.74	99.89
6	A	920	PLC	C2-O2-C'	-2.07	112.71	117.79

There are no chirality outliers.

All (38) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
6	A	920	PLC	O2-C2-C3-O3
6	A	920	PLC	O4P-C4-C5-N
6	A	920	PLC	C5-C4-O4P-P
6	A	920	PLC	C4-O4P-P-O1P
7	A	921	3PE	O32-C31-O31-C3
7	A	921	3PE	C32-C31-O31-C3
6	A	920	PLC	O3P-C1-C2-O2
6	A	920	PLC	C1'-C2'-C3'-C4'
6	A	920	PLC	C5B-C6B-C7B-C8B
6	A	920	PLC	C6B-C7B-C8B-C9B
6	A	920	PLC	CB-C1B-C2B-C3B
6	A	920	PLC	C7B-C8B-C9B-CAA
6	B	804	PLC	C3'-C4'-C5'-C6'
6	A	920	PLC	C'-C1'-C2'-C3'
6	A	920	PLC	C1'-C'-O2-C2
6	A	920	PLC	O'-C'-O2-C2
6	A	920	PLC	O3P-C1-C2-C3
6	A	920	PLC	C1-C2-C3-O3
6	A	920	PLC	C4'-C5'-C6'-C7'
6	B	804	PLC	C8'-C9'-CA'-CB'
6	B	804	PLC	C5'-C6'-C7'-C8'
6	A	920	PLC	C8B-C9B-CAA-CBA
6	A	920	PLC	C4-O4P-P-O3P
6	B	804	PLC	C7'-C8'-C9'-CA'
6	B	804	PLC	C4'-C5'-C6'-C7'
6	A	920	PLC	C2B-C3B-C4B-C5B

Continued on next page...

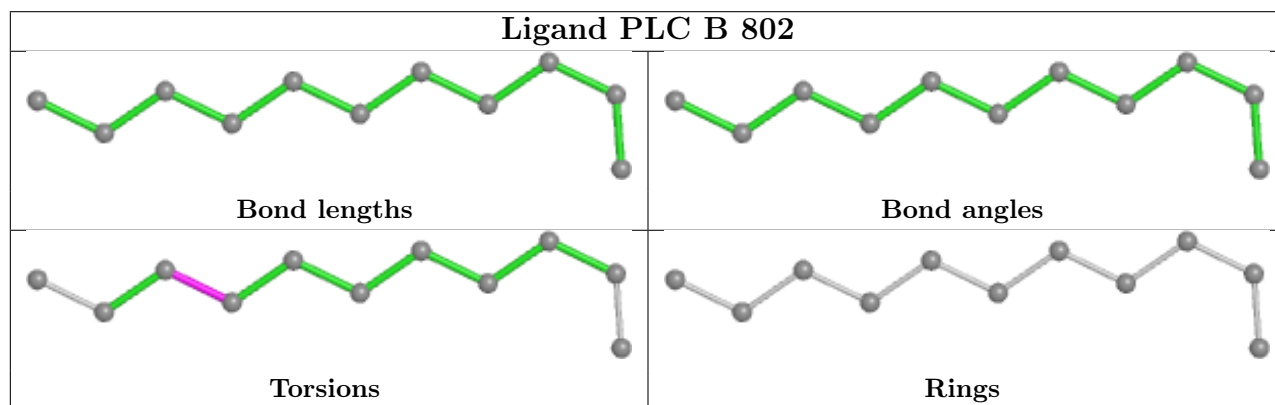
Continued from previous page...

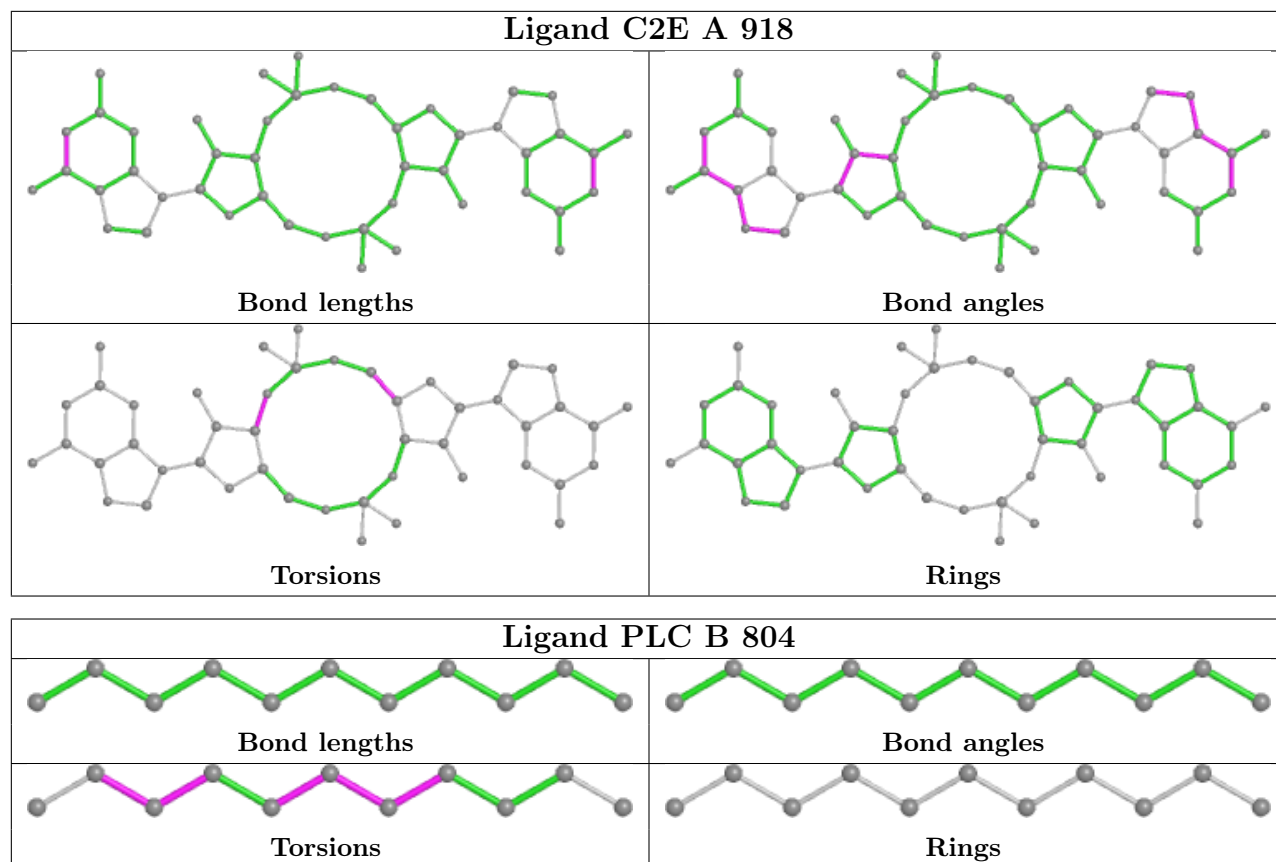
Mol	Chain	Res	Type	Atoms
7	A	921	3PE	C1-O11-P-O13
6	B	803	PLC	C7'-C8'-C9'-CA'
7	A	921	3PE	O31-C31-C32-C33
6	A	920	PLC	C2B-C1B-CB-O3
6	A	920	PLC	C2B-C1B-CB-OB
6	B	803	PLC	C3'-C4'-C5'-C6'
6	A	920	PLC	C1-O3P-P-O1P
7	A	921	3PE	C1-O11-P-O14
5	A	918	C2E	O4A-C4A-C5A-O5A
7	A	921	3PE	C12-C11-O13-P
6	B	802	PLC	C6'-C7'-C8'-C9'
5	A	918	C2E	C2'-C3'-O3'-P11

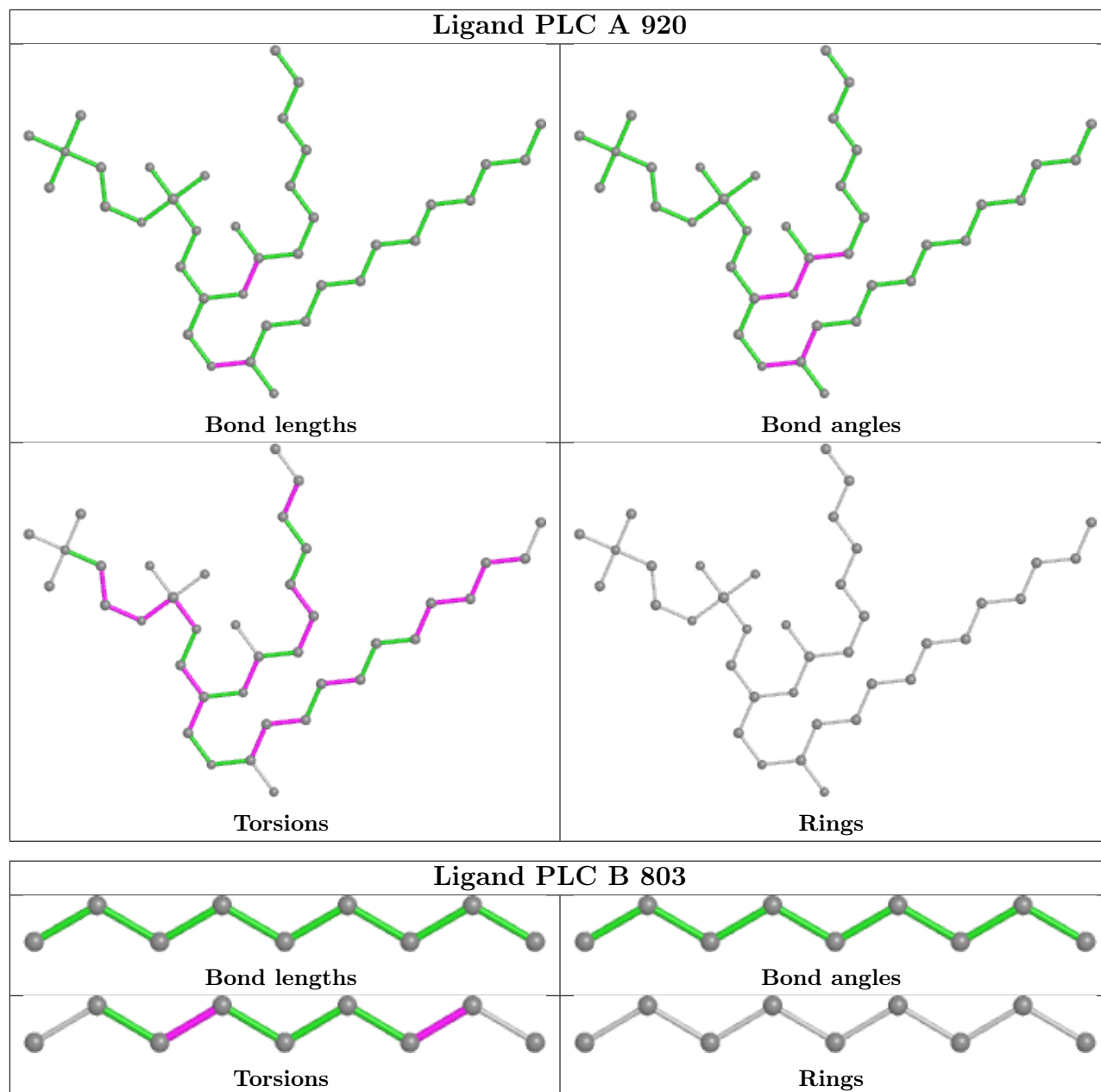
There are no ring outliers.

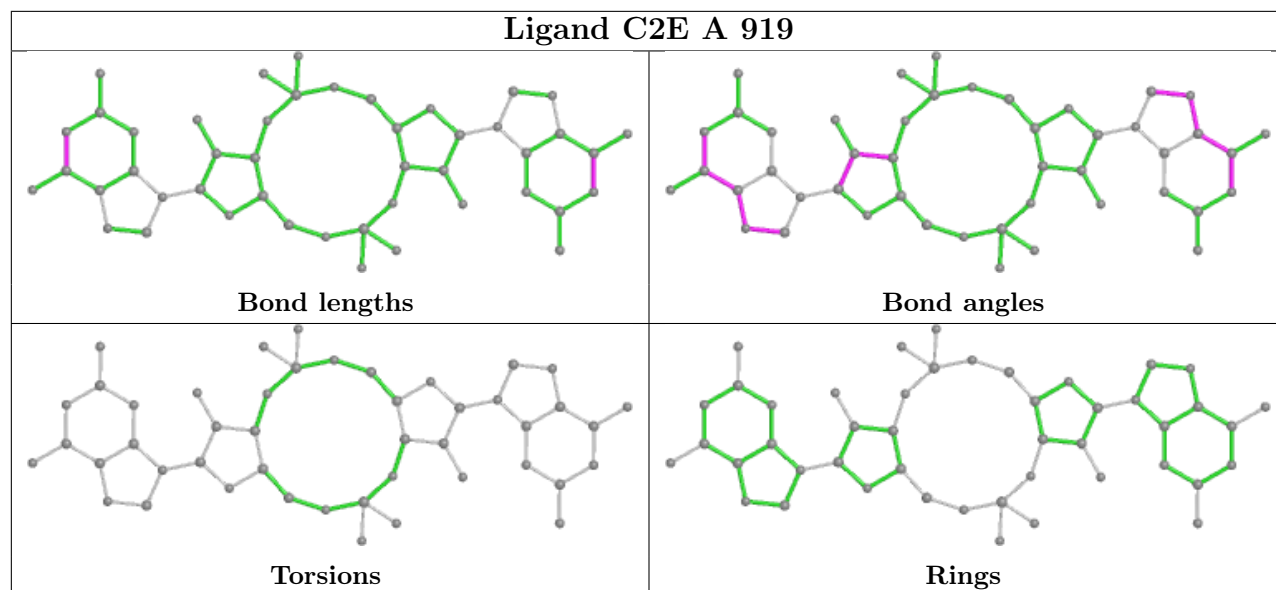
No monomer is involved in short contacts.

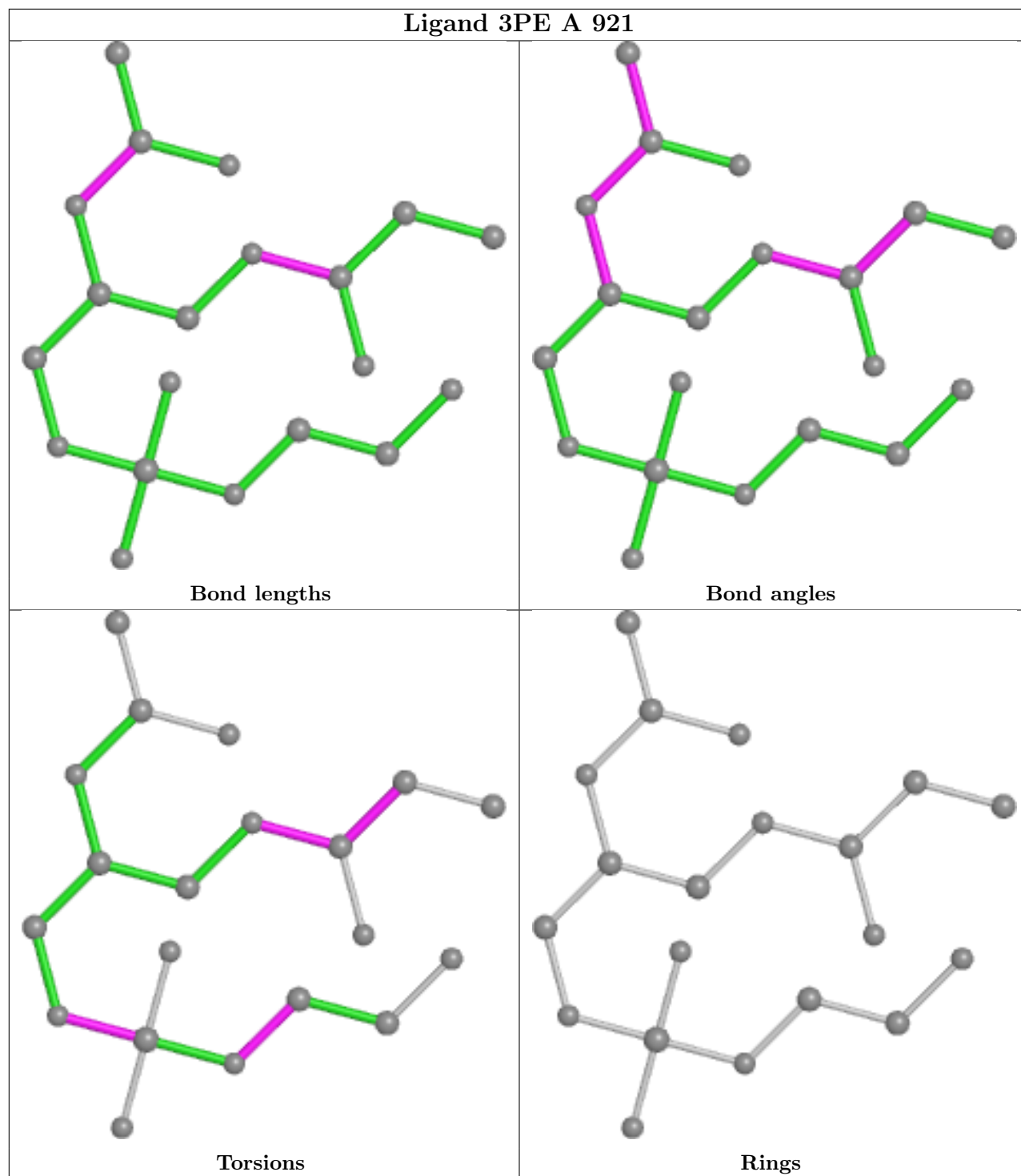
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. 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

There are no chain breaks in this entry.

6 Fit of model and data

6.1 Protein, DNA and RNA chains

In the following table, the column labelled ‘#RSRZ > 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q < 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	728/803 (90%)	0.16	39 (5%) 25 23	45, 69, 112, 162	0
2	B	655/724 (90%)	-0.06	21 (3%) 47 44	43, 61, 103, 148	0
3	D	0/9	-	-	-	-
All	All	1383/1536 (90%)	0.06	60 (4%) 35 31	43, 66, 109, 162	0

All (60) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	508	LYS	8.3
2	B	593	LEU	5.4
1	A	13	VAL	5.3
1	A	506	THR	5.1
1	A	509	ASP	5.0
2	B	589	VAL	4.8
1	A	15	PRO	4.7
1	A	511	THR	4.7
2	B	595	PRO	4.6
1	A	171	ARG	4.5
1	A	190	PRO	4.4
1	A	510	GLU	4.3
2	B	494	ASP	4.2
1	A	188	MET	4.0
2	B	594	ARG	3.9
1	A	318	CYS	3.8
1	A	14	VAL	3.8
1	A	739	ARG	3.6
2	B	77	GLN	3.6
2	B	167	ALA	3.5
1	A	705	ARG	3.5
1	A	740	ARG	3.5
1	A	16	VAL	3.5

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
1	A	194	LEU	3.3
2	B	596	GLY	3.3
2	B	68	VAL	3.2
1	A	505	VAL	3.1
1	A	94	LEU	3.1
2	B	265	ALA	3.1
2	B	590	ARG	3.0
2	B	592	MET	3.0
1	A	132	ARG	2.9
1	A	96	ALA	2.9
1	A	17	LEU	2.9
1	A	507	ALA	2.9
1	A	497	ARG	2.9
1	A	737	ARG	2.8
1	A	20	LEU	2.8
2	B	78	GLN	2.7
1	A	738	ARG	2.7
1	A	320	SER	2.6
1	A	319	GLY	2.6
1	A	503	PHE	2.5
1	A	23	VAL	2.4
1	A	192	PRO	2.4
1	A	276	HIS	2.4
2	B	76	GLY	2.3
1	A	137	GLU	2.3
2	B	718	ARG	2.3
2	B	591	ARG	2.3
2	B	109	GLU	2.2
1	A	735	PRO	2.2
1	A	203	ARG	2.2
2	B	198	ALA	2.2
1	A	199	GLN	2.1
2	B	264	ASP	2.1
1	A	136	PRO	2.1
2	B	677	VAL	2.1
2	B	132	ALA	2.1
1	A	620	ARG	2.1

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

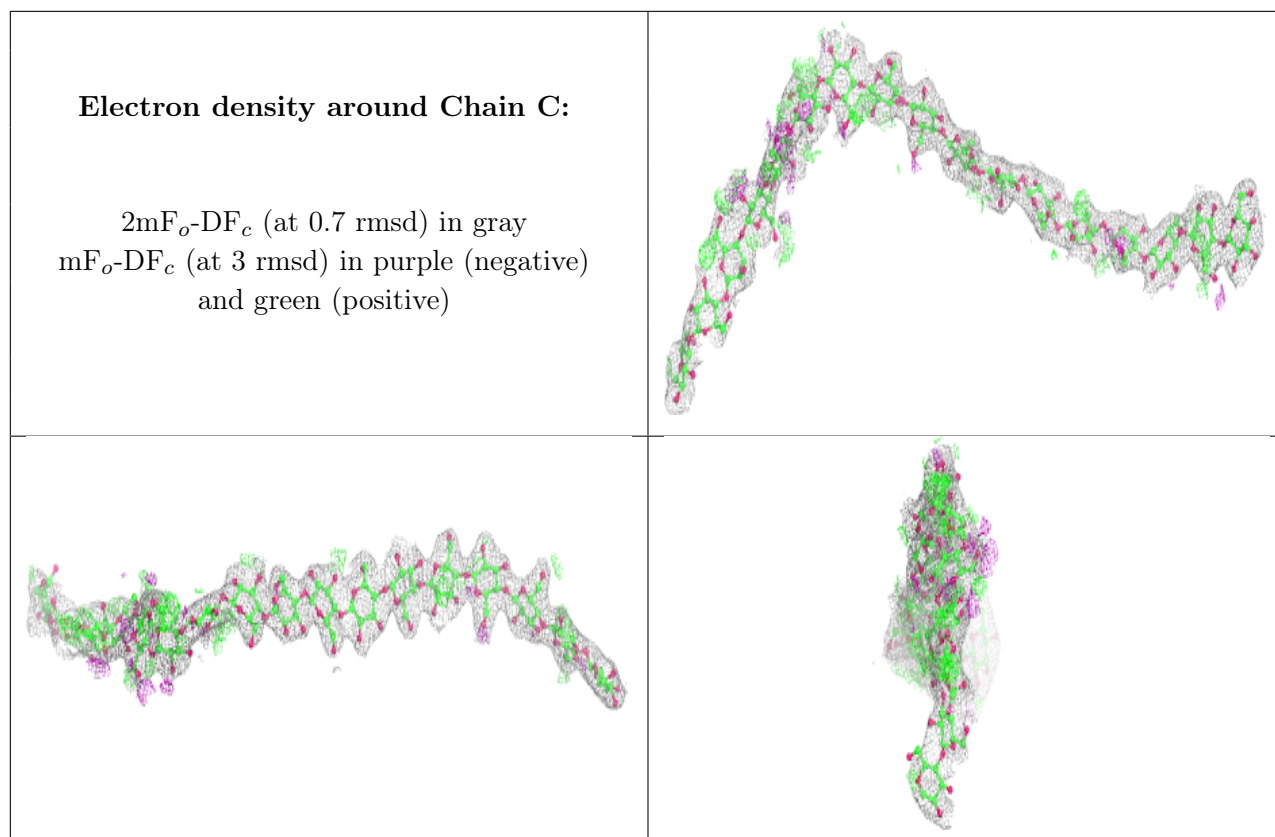
There are no non-standard protein/DNA/RNA residues in this entry.

6.3 Carbohydrates

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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
4	BGC	C	1	11/12	0.73	0.54	106,136,161,167	0
4	BGC	C	2	11/12	0.84	0.37	107,118,143,154	0
4	BGC	C	3	11/12	0.91	0.20	66,93,110,122	0
4	BGC	C	4	11/12	0.93	0.18	45,56,132,152	0
4	BGC	C	5	11/12	0.94	0.14	34,48,64,66	0
4	BGC	C	14	11/12	0.94	0.17	49,58,75,77	0
4	BGC	C	7	11/12	0.95	0.10	32,40,62,67	0
4	BGC	C	8	11/12	0.95	0.15	37,54,91,98	0
4	BGC	C	6	11/12	0.95	0.14	20,38,84,108	0
4	BGC	C	16	11/12	0.95	0.33	48,62,87,117	0
4	BGC	C	12	11/12	0.96	0.17	43,52,63,73	0
4	BGC	C	13	11/12	0.96	0.17	49,55,64,65	0
4	BGC	C	9	11/12	0.96	0.12	45,59,76,92	0
4	BGC	C	10	11/12	0.96	0.18	53,63,80,85	0
4	BGC	C	17	11/12	0.96	0.33	50,60,70,85	0
4	BGC	C	15	11/12	0.97	0.20	43,45,70,71	0
4	BGC	C	11	11/12	0.98	0.15	42,57,75,83	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](#)

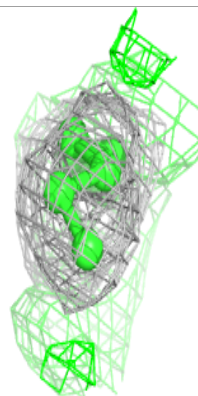
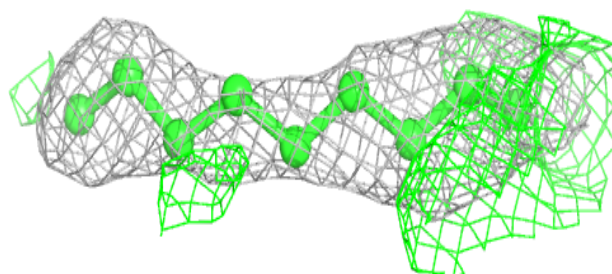
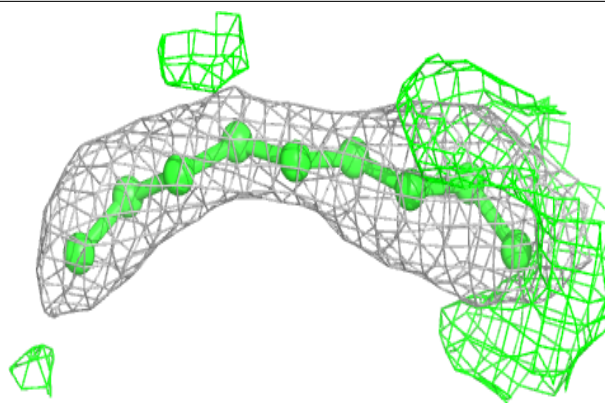
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q < 0.9' lists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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
6	PLC	B	803	9/42	0.84	0.20	50,78,86,89	0
6	PLC	A	920	38/42	0.87	0.38	77,105,134,161	0
6	PLC	B	802	11/42	0.89	0.25	56,68,80,82	0
6	PLC	B	804	11/42	0.91	0.37	65,74,86,87	0
8	MG	B	801	1/1	0.91	0.12	38,38,38,38	0
7	3PE	A	921	20/51	0.93	0.21	65,78,125,128	0
5	C2E	A	918	46/46	0.97	0.11	37,46,58,65	0
5	C2E	A	919	46/46	0.97	0.13	36,51,63,75	0

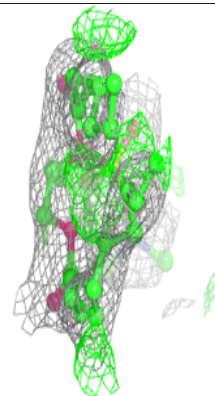
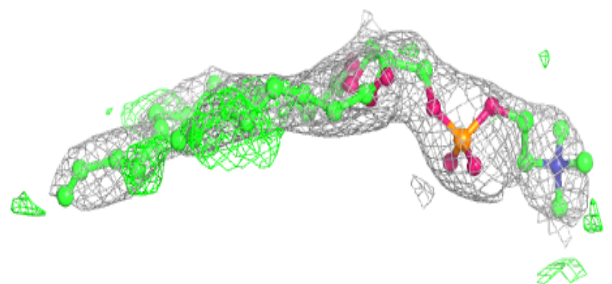
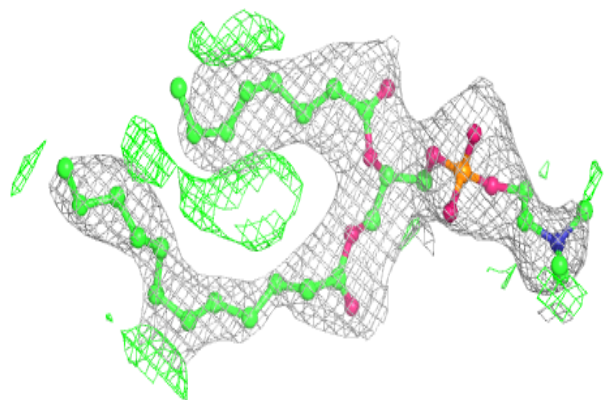
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

Electron density around PLC B 803:

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

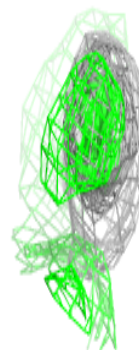
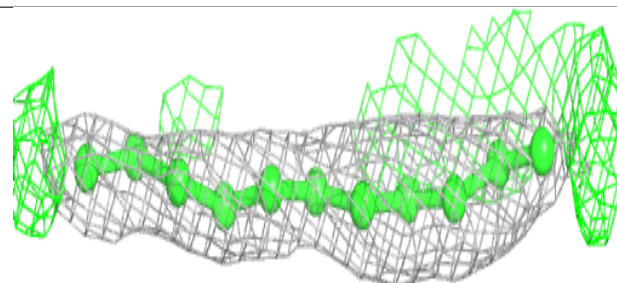
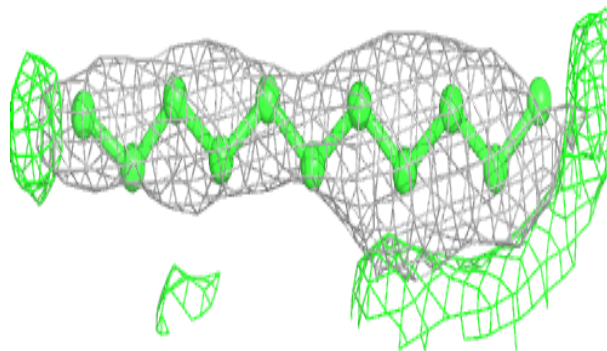
**Electron density around PLC A 920:**

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

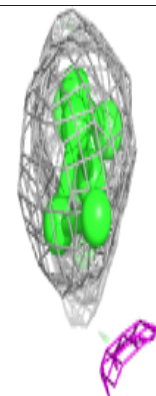
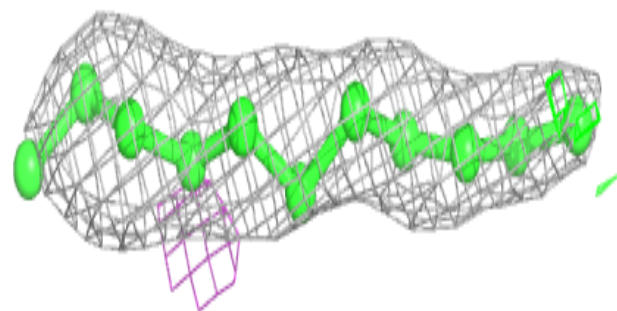
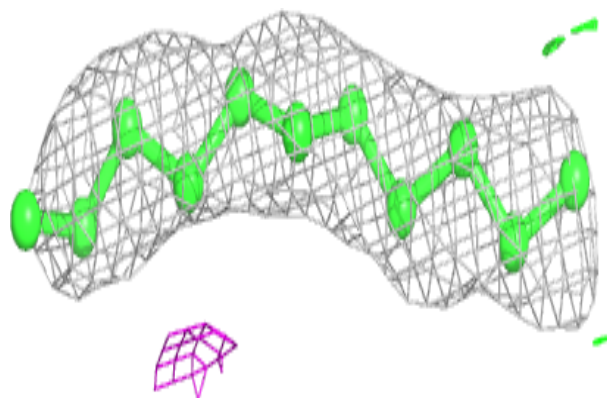


Electron density around PLC B 802:

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

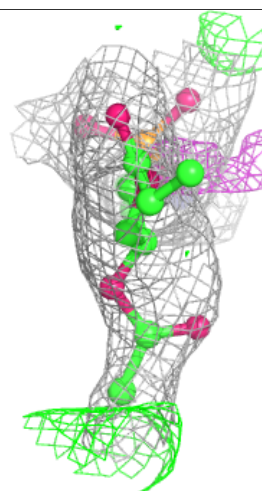
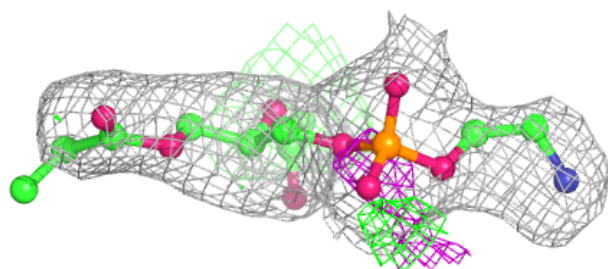
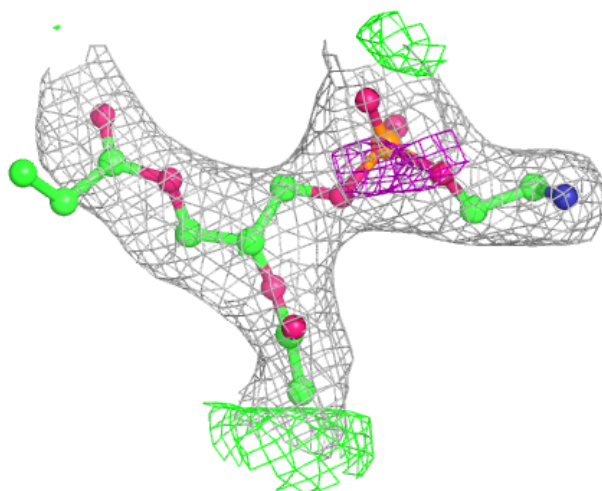
**Electron density around PLC B 804:**

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



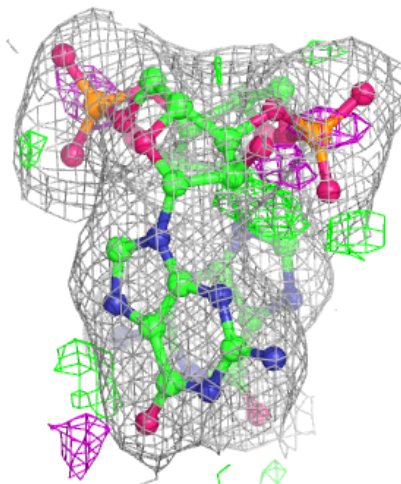
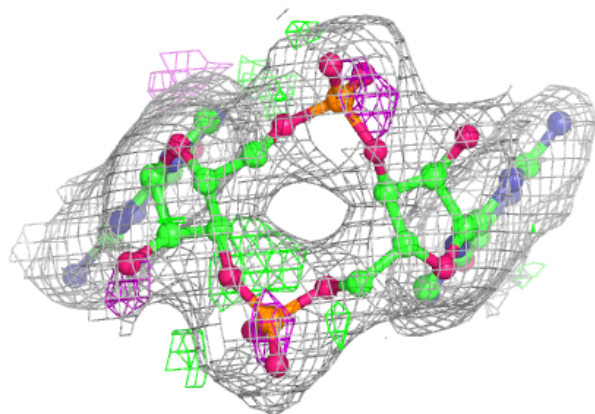
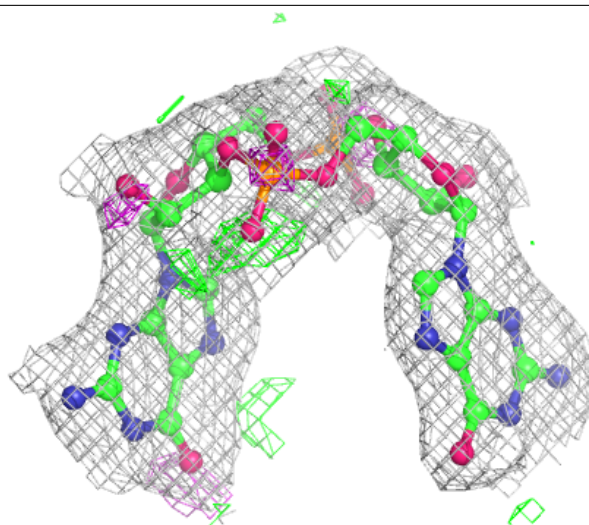
Electron density around 3PE A 921:

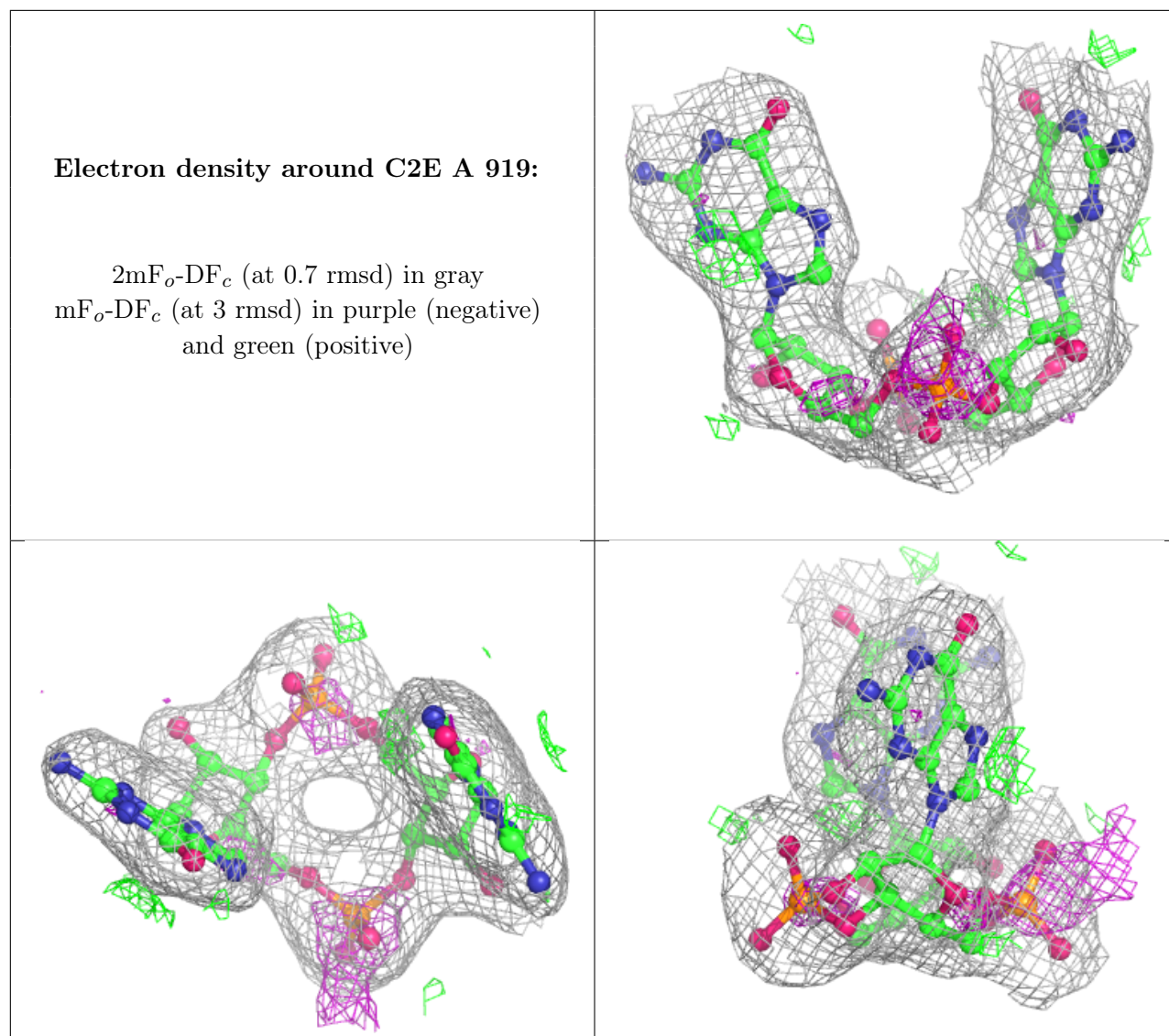
$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



Electron density around C2E A 918:

$2mF_o-DF_c$ (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.