W O R L D W I D E
wwPDB
PROTEIN DATA BANK

wwPDB X-ray Structure Validation Summary Report (i)

Apr 22, 2025 – 02:09 PM EDT

PDB ID	:	9DOX / pdb_00009dox
Title	:	Fibrillar assembly of an L-enantiopure, C-alpha methylated, macrocyclic beta-hairpin
Authors	:	Samdin, T.D.; Lubkowski, J.; Anderson, C.F.; Schneider, J.P.
Deposited on	:	2024-09-20
Resolution	:	2.25 Å(reported)

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

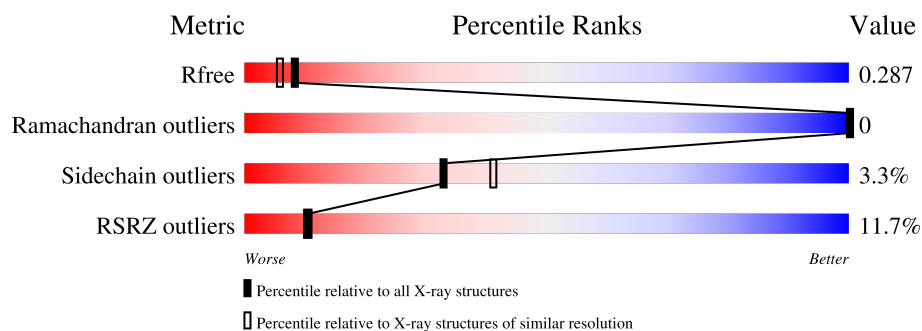|		
MolProbity	:	4.02b-467
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	2.0rc1
EDS	:	3.0
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.006 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.42

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 2.25 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	Percentile Ranks	Value
Rfree		0.287
Ramachandran outliers		0
Sidechain outliers		3.3%
RSRZ outliers		11.7%

Worse   *Better*

■ Percentile relative to all X-ray structures
❙ Percentile relative to X-ray structures of similar resolution

Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	164625	1763 (2.26-2.26)
Ramachandran outliers	177936	1884 (2.26-2.26)
Sidechain outliers	177891	1885 (2.26-2.26)
RSRZ outliers	164620	1763 (2.26-2.26)

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 <=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	13	92% 8%
1	B	13	92% 8%
1	C	13	8% / 92% 8%
1	D	13	8% / 92% 8%
1	E	13	92% 8%
1	F	13	23% / 85% 15%
1	a	13	92% 8%

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| Mol	Chain	Length	Quality of chain
1	b	13	15% ▬▬▬ 85% ▬▬▬▬▬▬▬▬▬▬ 15%
1	c	13	8% ▬ 92% ▬▬▬▬▬▬▬▬▬▬ 8%
1	d	13	92% ▬▬▬▬▬▬▬▬▬▬ 8%
1	e	13	8% ▬ 85% ▬▬▬▬▬▬▬▬▬ 15%
1	f	13	38% ▬▬▬▬▬ 85% ▬▬▬▬▬▬▬▬ 15%

2 Entry composition ⓘ

There are 3 unique types of molecules in this entry. The entry contains 1334 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 L-enantiopure, C-alpha methylated, macrocyclic beta-hairpin.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
1	A	13	Total	C	N	O	0	0	0
			101	69	18	14			
1	a	13	Total	C	N	O	0	0	0
			101	69	18	14			
1	B	13	Total	C	N	O	0	0	0
			101	69	18	14			
1	b	13	Total	C	N	O	0	0	0
			101	69	18	14			
1	C	13	Total	C	N	O	0	0	0
			101	69	18	14			
1	c	13	Total	C	N	O	0	0	0
			101	69	18	14			
1	D	13	Total	C	N	O	0	0	0
			101	69	18	14			
1	d	13	Total	C	N	O	0	0	0
			101	69	18	14			
1	E	13	Total	C	N	O	0	0	0
			101	69	18	14			
1	e	13	Total	C	N	O	0	0	0
			101	69	18	14			
1	F	13	Total	C	N	O	0	0	0
			101	69	18	14			
1	f	13	Total	C	N	O	0	0	0
			101	69	18	14			

- Molecule 2 is 5-amino-2,4,6-triiodobenzene-1,3-dicarboxylic acid (CCD ID: I3C) (formula: $C_8H_4I_3NO_4$).

I3C
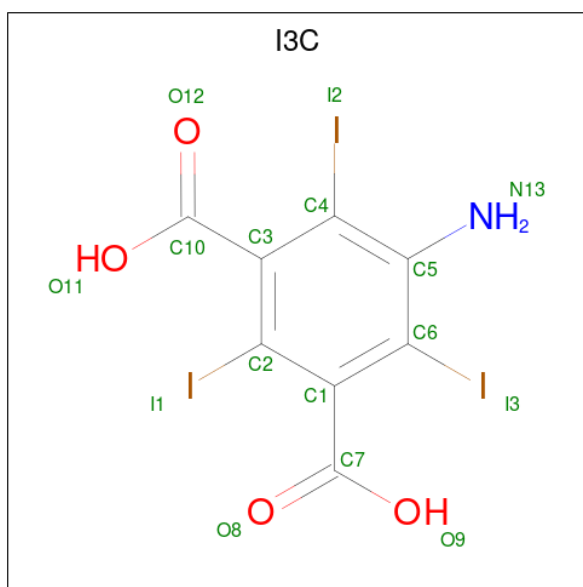
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	B	1	Total	C	I	N	O	0	0
			16	8	3	1	4		
2	C	1	Total	C	I	N	O	0	0
			16	8	3	1	4		
2	c	1	Total	C	I	N	O	0	0
			16	8	3	1	4		
2	D	1	Total	C	I	N	O	0	0
			16	8	3	1	4		
2	E	1	Total	C	I	N	O	0	0
			16	8	3	1	4		
2	f	1	Total	C	I	N	O	0	0
			16	8	3	1	4		

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	2	Total	O	0	0
			2	2		
3	a	2	Total	O	0	0
			2	2		
3	B	3	Total	O	0	0
			3	3		
3	b	1	Total	O	0	0
			1	1		
3	C	4	Total	O	0	0
			4	4		
3	c	3	Total	O	0	0
			3	3		

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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	D	3	Total 3	O 3	0	0
3	E	3	Total 3	O 3	0	0
3	e	1	Total 1	O 1	0	0
3	F	2	Total 2	O 2	0	0
3	f	2	Total 2	O 2	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: L-enantiopure, C-alpha methylated, macrocyclic beta-hairpin

Chain A:

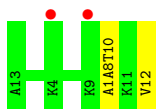• Molecule 1: L-enantiopure, C-alpha methylated, macrocyclic beta-hairpin

Chain a:

• Molecule 1: L-enantiopure, C-alpha methylated, macrocyclic beta-hairpin

Chain B:

• Molecule 1: L-enantiopure, C-alpha methylated, macrocyclic beta-hairpin

Chain b:

• Molecule 1: L-enantiopure, C-alpha methylated, macrocyclic beta-hairpin
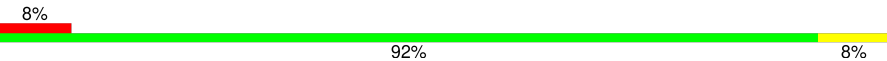
Chain C:

- Molecule 1: L-enantiopure, C-alpha methylated, macrocyclic beta-hairpin

Chain c:

- Molecule 1: L-enantiopure, C-alpha methylated, macrocyclic beta-hairpin

Chain D:
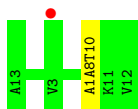

- Molecule 1: L-enantiopure, C-alpha methylated, macrocyclic beta-hairpin

Chain d:

- Molecule 1: L-enantiopure, C-alpha methylated, macrocyclic beta-hairpin

Chain E:

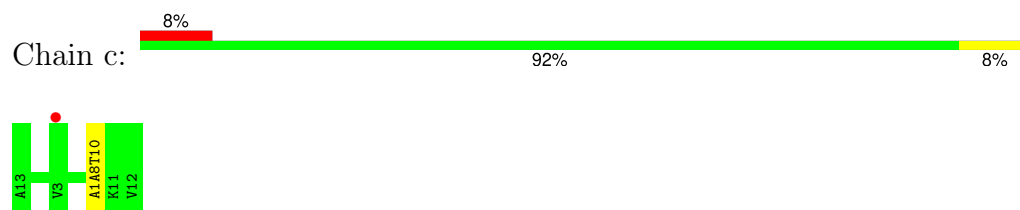- Molecule 1: L-enantiopure, C-alpha methylated, macrocyclic beta-hairpin

Chain e:

- Molecule 1: L-enantiopure, C-alpha methylated, macrocyclic beta-hairpin

Chain F:

- Molecule 1: L-enantiopure, C-alpha methylated, macrocyclic beta-hairpin
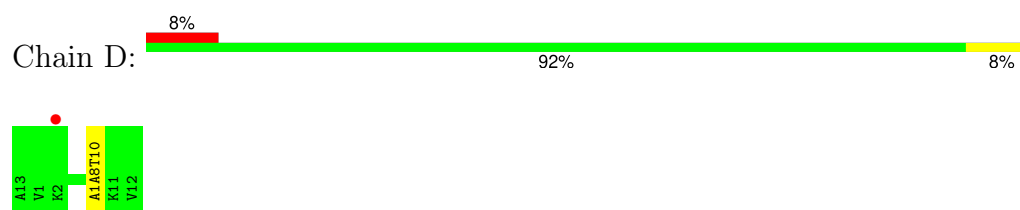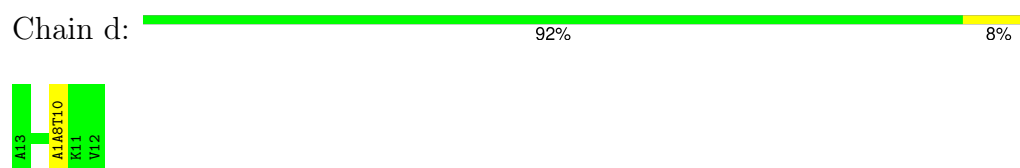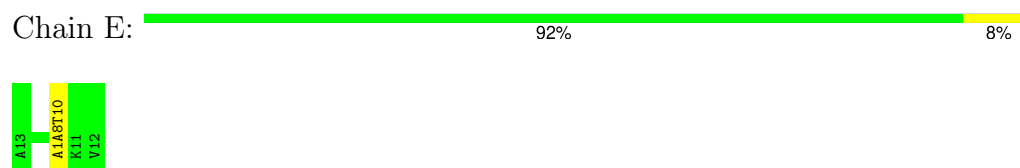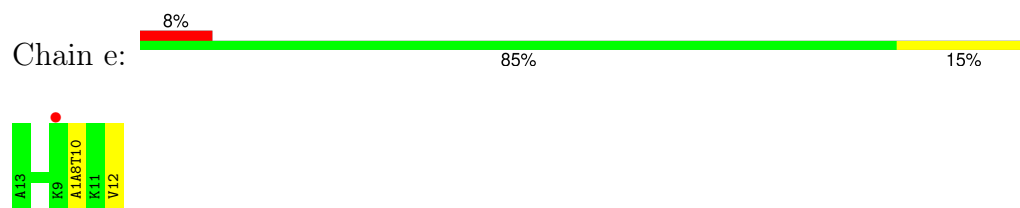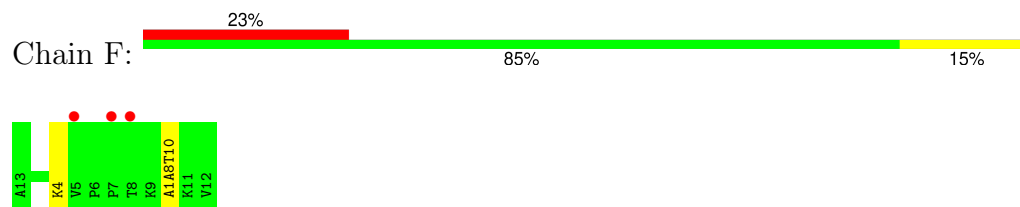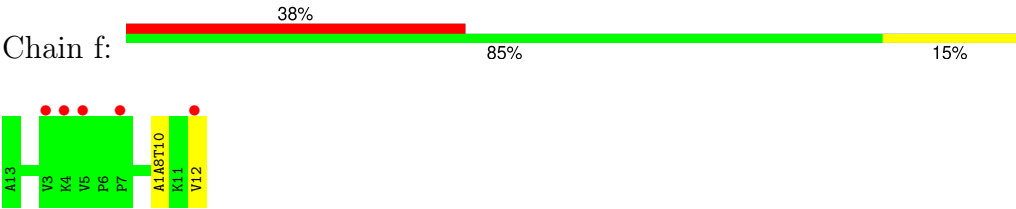
Chain f:

38%

85%

15%

A13 V3 K4 V5 P6 P7 A1 A8 T10 K11 V12

4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 41 21 2	Depositor
Cell constants a, b, c, α, β, γ	57.50Å 57.50Å 114.06Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	40.69 – 2.25 40.69 – 2.25	Depositor EDS
% Data completeness (in resolution range)	99.6 (40.69-2.25) 99.9 (40.69-2.25)	Depositor EDS
R_{merge}	0.12	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	9.80 (at 2.24Å)	Xtriage
Refinement program	REFMAC 5.8.0425	Depositor
R, R_{free}	0.237 , 0.284 0.242 , 0.287	Depositor DCC
R_{free} test set	486 reflections (5.04%)	wwPDB-VP
Wilson B-factor (Å^2)	34.2	Xtriage
Anisotropy	0.186	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.29 , 29.7	EDS
L-test for twinning[2]	$< |L| > = 0.50, < L^2 > = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.91	EDS
Total number of atoms	1334	wwPDB-VP
Average B, all atoms (Å^2)	33.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 44.67 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 1.4753e-04. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

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[1]Intensities estimated from amplitudes.
[2]Theoretical values of $< |L| >$, $< L^2 >$ 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: ORN, I3C, A1A8T, DPR

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	0.42	0/76	0.95	0/96
1	B	0.43	0/76	0.90	0/96
1	C	0.40	0/76	0.88	0/96
1	D	0.38	0/76	1.02	0/96
1	E	0.43	0/76	0.95	0/96
1	F	0.44	0/76	1.02	0/96
1	a	0.42	0/76	0.90	0/96
1	b	0.34	0/76	1.10	0/96
1	c	0.38	0/76	0.93	0/96
1	d	0.38	0/76	0.92	0/96
1	e	0.41	0/76	1.17	0/96
1	f	0.39	0/76	0.93	0/96
All	All	0.40	0/912	0.98	0/1152

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 ⓘ

Due to software issues we are unable to calculate clashes - this section is therefore empty.

5.3 Torsion angles ⓘ

5.3.1 Protein backbone ⓘ

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	9/13 (69%)	9 (100%)	0	0	100	100
1	B	9/13 (69%)	9 (100%)	0	0	100	100
1	C	9/13 (69%)	9 (100%)	0	0	100	100
1	D	9/13 (69%)	9 (100%)	0	0	100	100
1	E	9/13 (69%)	9 (100%)	0	0	100	100
1	F	9/13 (69%)	9 (100%)	0	0	100	100
1	a	9/13 (69%)	9 (100%)	0	0	100	100
1	b	9/13 (69%)	9 (100%)	0	0	100	100
1	c	9/13 (69%)	9 (100%)	0	0	100	100
1	d	9/13 (69%)	9 (100%)	0	0	100	100
1	e	9/13 (69%)	9 (100%)	0	0	100	100
1	f	9/13 (69%)	9 (100%)	0	0	100	100
All	All	108/156 (69%)	108 (100%)	0	0	100	100

There are no Ramachandran outliers to report.

5.3.2 Protein sidechains ⓘ

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	10/10 (100%)	10 (100%)	0	100	100
1	B	10/10 (100%)	10 (100%)	0	100	100

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	C	10/10 (100%)	10 (100%)	0	100	100
1	D	10/10 (100%)	10 (100%)	0	100	100
1	E	10/10 (100%)	10 (100%)	0	100	100
1	F	10/10 (100%)	9 (90%)	1 (10%)	6	4
1	a	10/10 (100%)	10 (100%)	0	100	100
1	b	10/10 (100%)	9 (90%)	1 (10%)	6	4
1	c	10/10 (100%)	10 (100%)	0	100	100
1	d	10/10 (100%)	10 (100%)	0	100	100
1	e	10/10 (100%)	9 (90%)	1 (10%)	6	4
1	f	10/10 (100%)	9 (90%)	1 (10%)	6	4
All	All	120/120 (100%)	116 (97%)	4 (3%)	33	41

All (4) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	b	12	VAL
1	e	12	VAL
1	F	4	LYS
1	f	12	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

5.3.3   RNA ⓘ

There are no RNA molecules in this entry.

5.4   Non-standard residues in protein, DNA, RNA chains ⓘ

36 non-standard protein/DNA/RNA residues 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	#$\|Z\|>2$
1	ORN	B	13	1	6,7,8	0.47	0	2,7,9	0.14	0
1	ORN	C	13	1	6,7,8	0.51	0	2,7,9	0.20	0
1	A1A8T	A	10	1	3,7,8	0.62	0	7,10,12	1.80	2 (28%)
1	ORN	e	13	1	6,7,8	0.48	0	2,7,9	0.94	0
1	ORN	b	13	1	6,7,8	0.42	0	2,7,9	0.24	0
1	ORN	A	13	1	6,7,8	0.47	0	2,7,9	0.08	0
1	ORN	F	13	1	6,7,8	0.60	0	2,7,9	0.11	0
1	A1A8T	C	10	1	3,7,8	0.60	0	7,10,12	1.36	1 (14%)
1	A1A8T	F	10	1	3,7,8	0.61	0	7,10,12	1.29	1 (14%)
1	A1A8T	c	10	1	3,7,8	0.62	0	7,10,12	1.45	1 (14%)
1	A1A8T	B	10	1	3,7,8	0.54	0	7,10,12	1.57	1 (14%)
1	ORN	E	13	1	6,7,8	0.48	0	2,7,9	0.33	0
1	A1A8T	D	10	1	3,7,8	0.72	0	7,10,12	1.36	1 (14%)
1	ORN	a	13	1	6,7,8	0.48	0	2,7,9	0.26	0
1	A1A8T	f	10	1	3,7,8	0.52	0	7,10,12	1.28	1 (14%)
1	ORN	D	13	1	6,7,8	0.51	0	2,7,9	0.16	0
1	ORN	c	13	1	6,7,8	0.48	0	2,7,9	0.20	0
1	A1A8T	d	10	1	3,7,8	0.63	0	7,10,12	1.52	1 (14%)
1	ORN	f	13	1	6,7,8	0.50	0	2,7,9	0.35	0
1	A1A8T	e	10	1	3,7,8	0.52	0	7,10,12	1.76	1 (14%)
1	ORN	d	13	1	6,7,8	0.46	0	2,7,9	0.41	0
1	A1A8T	b	10	1	3,7,8	0.56	0	7,10,12	1.54	1 (14%)
1	A1A8T	E	10	1	3,7,8	0.50	0	7,10,12	1.45	1 (14%)
1	A1A8T	a	10	1	3,7,8	0.65	0	7,10,12	1.94	2 (28%)

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
1	ORN	B	13	1	-	0/5/6/8	-
1	ORN	C	13	1	-	0/5/6/8	-
1	A1A8T	A	10	1	-	0/5/9/12	-
1	ORN	e	13	1	-	1/5/6/8	-
1	ORN	b	13	1	-	0/5/6/8	-
1	ORN	A	13	1	-	0/5/6/8	-
1	ORN	F	13	1	-	0/5/6/8	-
1	A1A8T	C	10	1	-	1/5/9/12	-
1	A1A8T	F	10	1	-	0/5/9/12	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
1	A1A8T	c	10	1	-	1/5/9/12	-
1	A1A8T	B	10	1	-	5/5/9/12	-
1	ORN	E	13	1	-	0/5/6/8	-
1	A1A8T	D	10	1	-	0/5/9/12	-
1	ORN	a	13	1	-	0/5/6/8	-
1	A1A8T	f	10	1	-	1/5/9/12	-
1	ORN	D	13	1	-	0/5/6/8	-
1	ORN	c	13	1	-	0/5/6/8	-
1	A1A8T	d	10	1	-	0/5/9/12	-
1	ORN	f	13	1	-	0/5/6/8	-
1	A1A8T	e	10	1	-	0/5/9/12	-
1	ORN	d	13	1	-	0/5/6/8	-
1	A1A8T	b	10	1	-	2/5/9/12	-
1	A1A8T	E	10	1	-	1/5/9/12	-
1	A1A8T	a	10	1	-	0/5/9/12	-

There are no bond length outliers.

The worst 5 of 14 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	a	10	A1A8T	O-C-CA	-4.23	119.10	125.36
1	e	10	A1A8T	O-C-CA	-4.22	119.11	125.36
1	A	10	A1A8T	O-C-CA	-3.97	119.48	125.36
1	d	10	A1A8T	O-C-CA	-3.73	119.83	125.36
1	b	10	A1A8T	O-C-CA	-3.62	120.00	125.36

There are no chirality outliers.

5 of 12 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
1	B	10	A1A8T	C-CA-CB-CG1
1	B	10	A1A8T	C-CA-CB-CG2
1	B	10	A1A8T	C1-CA-CB-CG1
1	B	10	A1A8T	C1-CA-CB-CG2
1	b	10	A1A8T	C-CA-CB-CG2

There are no ring outliers.

No monomer is involved in short contacts.

5.5 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

6 ligands 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	I3C	E	101	-	16,16,16	1.64	3 (18%)	24,24,24	3.37	11 (45%)
2	I3C	C	101	-	16,16,16	1.21	1 (6%)	24,24,24	2.71	8 (33%)
2	I3C	D	101	-	16,16,16	1.34	2 (12%)	24,24,24	2.54	7 (29%)
2	I3C	B	101	-	16,16,16	1.52	4 (25%)	24,24,24	3.03	14 (58%)
2	I3C	c	101	-	16,16,16	2.04	5 (31%)	24,24,24	3.75	13 (54%)
2	I3C	f	101	-	16,16,16	0.93	0	24,24,24	2.39	10 (41%)

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	I3C	E	101	-	-	0/8/8/8	0/1/1/1
2	I3C	C	101	-	-	4/8/8/8	0/1/1/1
2	I3C	D	101	-	-	0/8/8/8	0/1/1/1
2	I3C	B	101	-	-	0/8/8/8	0/1/1/1
2	I3C	c	101	-	-	0/8/8/8	0/1/1/1
2	I3C	f	101	-	-	4/8/8/8	0/1/1/1

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

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	c	101	I3C	C2-I1	4.45	2.18	2.09
2	E	101	I3C	C4-I2	3.89	2.16	2.09

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	c	101	I3C	C6-I3	3.72	2.16	2.09
2	E	101	I3C	C2-I1	3.34	2.15	2.09
2	B	101	I3C	C2-I1	3.29	2.15	2.09

The worst 5 of 63 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	c	101	I3C	C3-C4-C5	-8.68	115.67	122.27
2	E	101	I3C	C3-C4-C5	-8.40	115.89	122.27
2	c	101	I3C	C1-C6-C5	-7.13	116.85	122.27
2	E	101	I3C	C4-C5-C6	7.04	122.62	116.39
2	c	101	I3C	C4-C5-C6	6.91	122.50	116.39

There are no chirality outliers.

5 of 8 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	C	101	I3C	C6-C1-C7-O8
2	C	101	I3C	C6-C1-C7-O9
2	C	101	I3C	C2-C1-C7-O8
2	C	101	I3C	C2-C1-C7-O9
2	f	101	I3C	C6-C1-C7-O8

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	c	101	I3C	0	1

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 then 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.
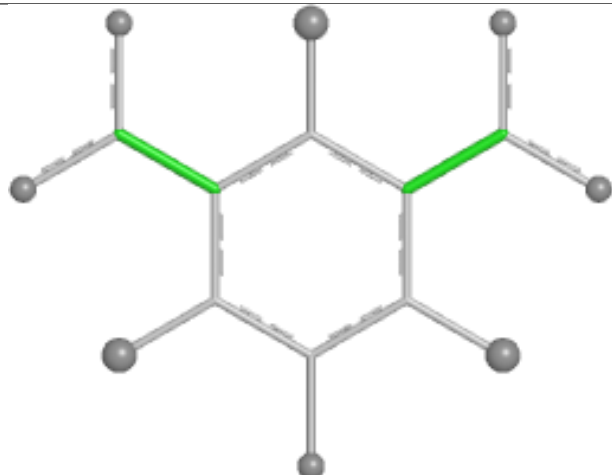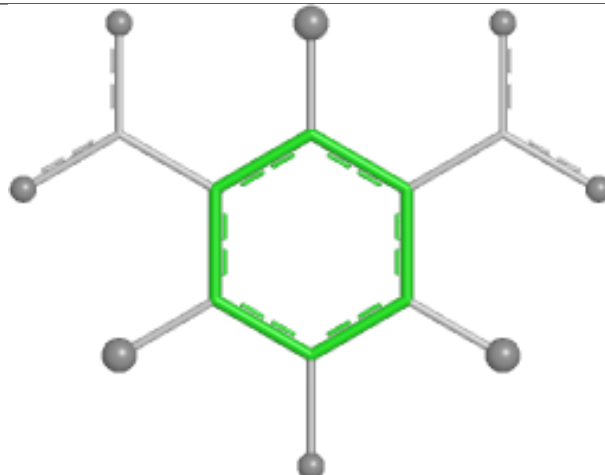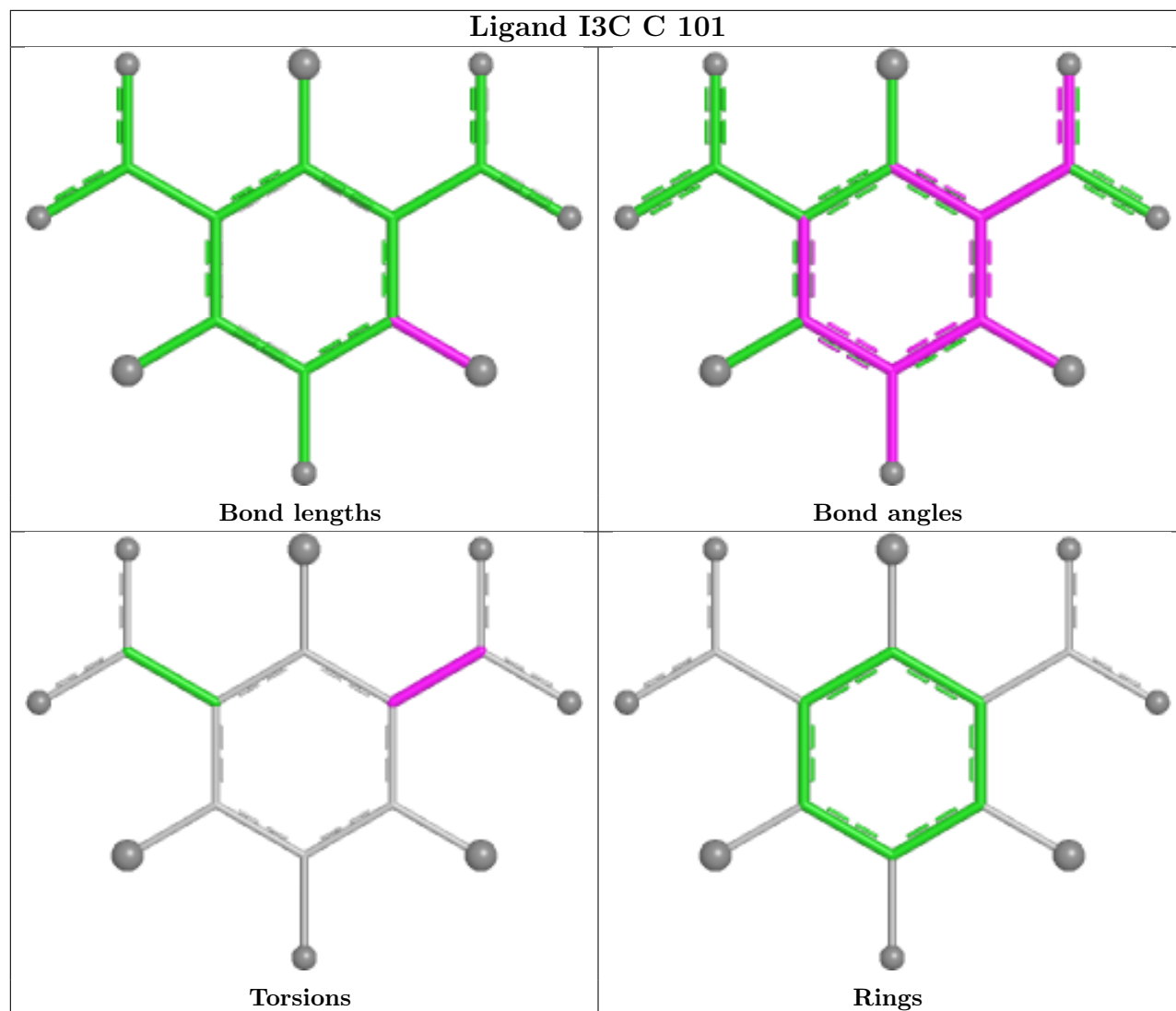
Ligand I3C E 101
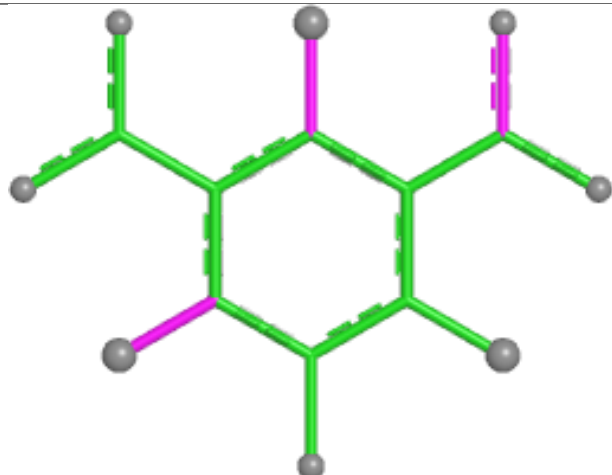
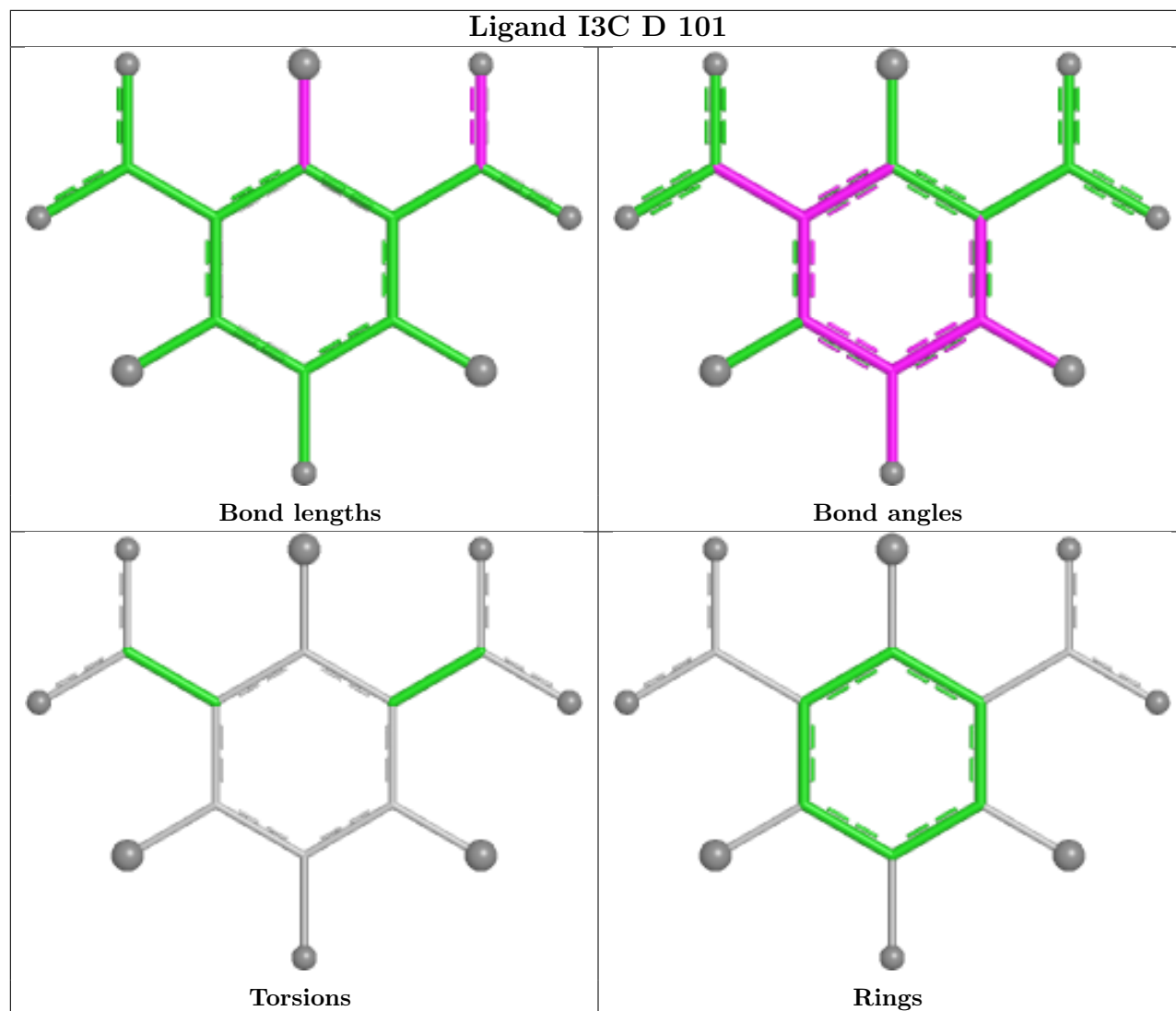Bond lengths

Bond angles

Torsions

Rings

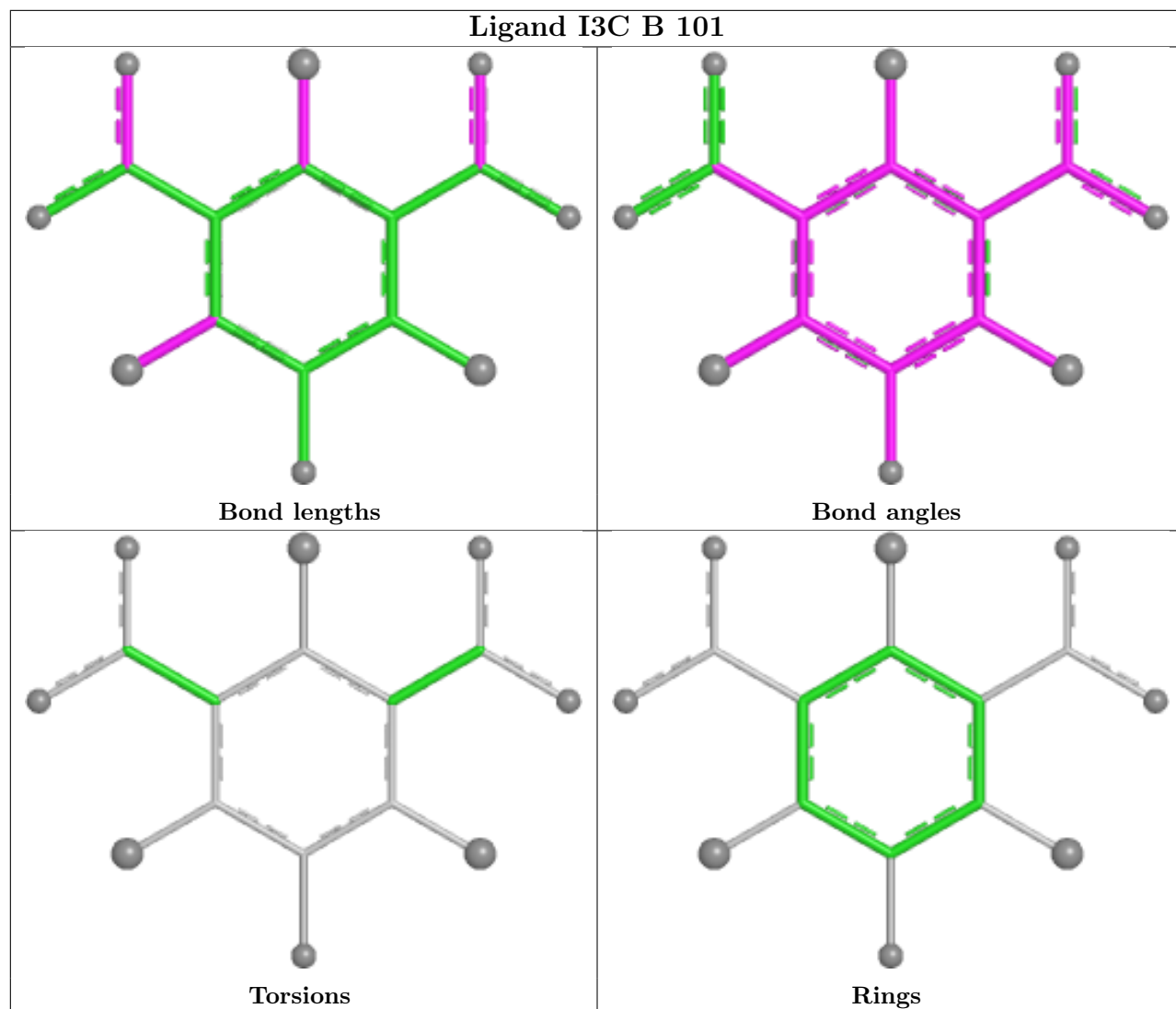## Ligand I3C C 101

Bond lengths

Bond angles

Torsions

Rings

Ligand I3C D 101

Bond lengths

Bond angles

Torsions

Rings

Ligand I3C B 101

Bond lengths

Bond angles

Torsions

Rings

Ligand I3C c 101

Bond lengths
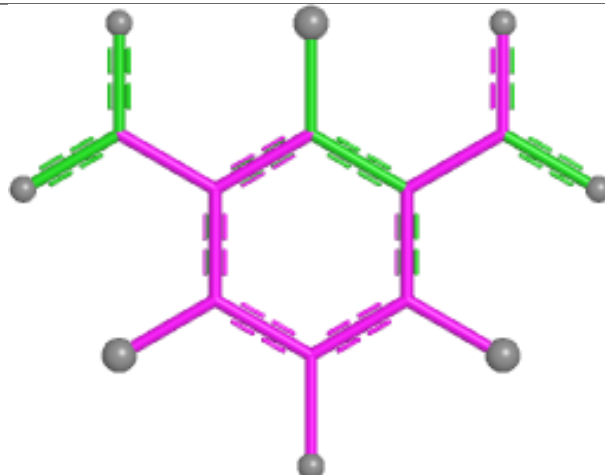
Bond angles

Torsions

Rings

Ligand I3C f 101
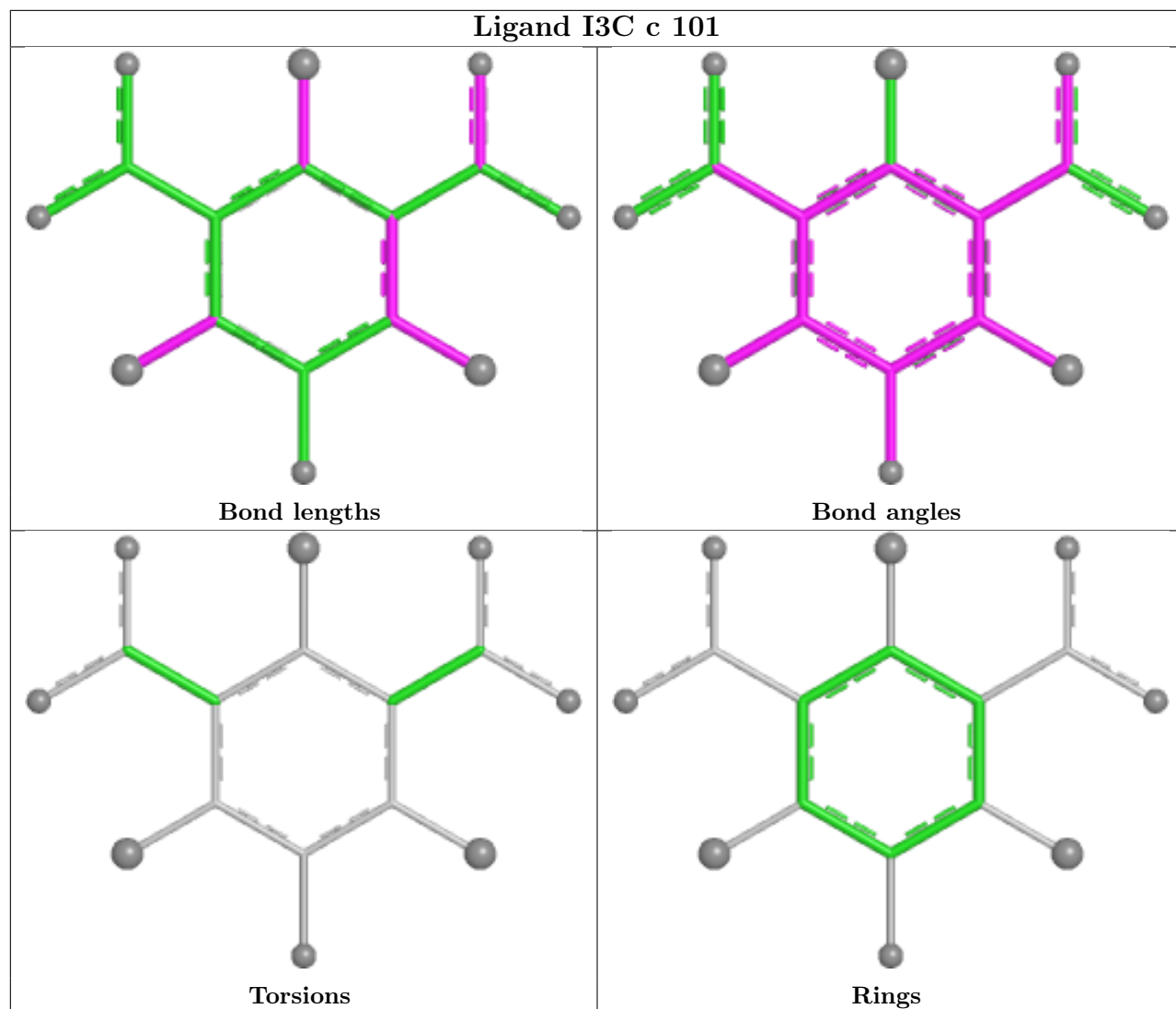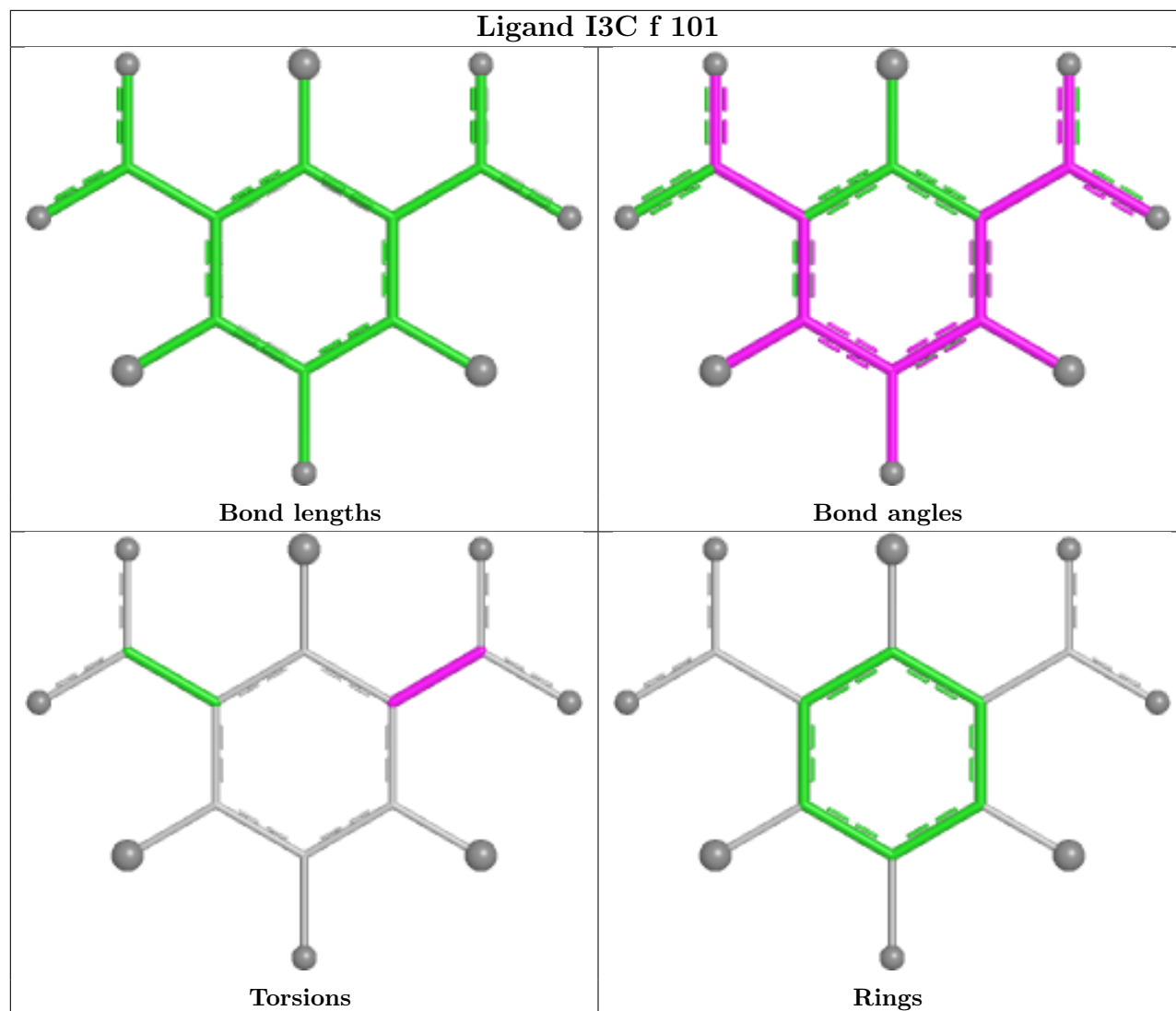
5.7 Other polymers ⓘ

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(Å²)	Q<0.9
1	A	10/13 (76%)	0.59	0	100	100	24, 26, 28, 30	0
1	B	10/13 (76%)	0.74	0	100	100	26, 29, 34, 34	0
1	C	10/13 (76%)	0.55	1 (10%)	14	13	28, 32, 34, 41	0
1	D	10/13 (76%)	0.54	1 (10%)	14	13	23, 27, 32, 33	0
1	E	10/13 (76%)	0.62	0	100	100	26, 28, 32, 36	0
1	F	10/13 (76%)	2.01	3 (30%)	1	1	27, 32, 49, 53	0
1	a	10/13 (76%)	0.36	0	100	100	23, 28, 35, 39	0
1	b	10/13 (76%)	1.29	2 (20%)	3	3	28, 33, 42, 55	0
1	c	10/13 (76%)	0.96	1 (10%)	14	13	28, 31, 39, 39	0
1	d	10/13 (76%)	0.59	0	100	100	24, 27, 34, 40	0
1	e	10/13 (76%)	1.27	1 (10%)	14	13	25, 30, 38, 45	0
1	f	10/13 (76%)	2.24	5 (50%)	0	0	32, 40, 59, 60	0
All	All	120/156 (76%)	0.98	14 (11%)	10	10	23, 31, 45, 60	0

The worst 5 of 14 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	F	5	VAL	4.9
1	f	5	VAL	4.6
1	b	9	LYS	4.3
1	e	9	LYS	3.7
1	f	7	PRO	3.6

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

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
1	A1A8T	b	10	8/9	0.54	0.28	44,50,54,61	0
1	DPR	F	6	7/8	0.59	0.24	52,56,59,60	0
1	DPR	f	6	7/8	0.65	0.22	64,67,68,69	0
1	ORN	A	13	8/9	0.73	0.20	26,28,31,32	0
1	A1A8T	f	10	8/9	0.76	0.20	28,34,37,46	0
1	A1A8T	e	10	8/9	0.77	0.18	32,34,36,36	0
1	ORN	a	13	8/9	0.81	0.18	24,24,27,29	0
1	A1A8T	d	10	8/9	0.81	0.13	23,24,25,27	0
1	ORN	F	13	8/9	0.82	0.17	25,28,28,29	0
1	ORN	e	13	8/9	0.83	0.16	26,28,30,31	0
1	A1A8T	a	10	8/9	0.83	0.12	21,23,25,26	0
1	ORN	D	13	8/9	0.85	0.17	27,29,29,31	0
1	A1A8T	B	10	8/9	0.85	0.14	26,29,34,35	0
1	ORN	C	13	8/9	0.87	0.13	30,33,34,36	0
1	DPR	C	6	7/8	0.87	0.20	35,38,42,43	0
1	A1A8T	C	10	8/9	0.87	0.14	26,28,31,32	0
1	ORN	c	13	8/9	0.87	0.17	26,30,32,35	0
1	ORN	B	13	8/9	0.87	0.15	27,28,31,32	0
1	ORN	b	13	8/9	0.87	0.12	27,29,30,32	0
1	DPR	c	6	7/8	0.88	0.12	35,38,38,40	0
1	ORN	f	13	8/9	0.88	0.11	34,35,37,37	0
1	DPR	D	6	7/8	0.89	0.15	36,38,45,46	0
1	ORN	E	13	8/9	0.89	0.14	26,32,33,39	0
1	A1A8T	A	10	8/9	0.90	0.10	23,24,27,30	0
1	DPR	e	6	7/8	0.90	0.12	29,32,34,34	0
1	ORN	d	13	8/9	0.91	0.14	24,26,28,30	0
1	A1A8T	E	10	8/9	0.91	0.12	27,29,30,32	0
1	DPR	A	6	7/8	0.92	0.12	28,29,34,35	0
1	DPR	B	6	7/8	0.92	0.11	29,30,33,36	0
1	DPR	b	6	7/8	0.92	0.11	26,29,31,36	0
1	DPR	a	6	7/8	0.93	0.09	32,33,35,35	0
1	A1A8T	D	10	8/9	0.93	0.10	23,27,29,30	0
1	DPR	E	6	7/8	0.94	0.08	28,30,32,33	0
1	DPR	d	6	7/8	0.94	0.10	31,31,34,35	0
1	A1A8T	F	10	8/9	0.95	0.07	24,26,27,27	0
1	A1A8T	c	10	8/9	0.95	0.08	23,25,27,28	0

6.3 Carbohydrates (i)

There are no monosaccharides in this entry.

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
2	I3C	f	101	16/16	0.95	0.15	52,61,86,92	0
2	I3C	E	101	16/16	0.98	0.10	29,34,55,67	0
2	I3C	C	101	16/16	0.98	0.09	32,38,57,66	0
2	I3C	D	101	16/16	0.99	0.08	25,30,48,49	0
2	I3C	B	101	16/16	0.99	0.08	26,31,48,53	0
2	I3C	c	101	16/16	0.99	0.08	26,30,35,43	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 I3C f 101:

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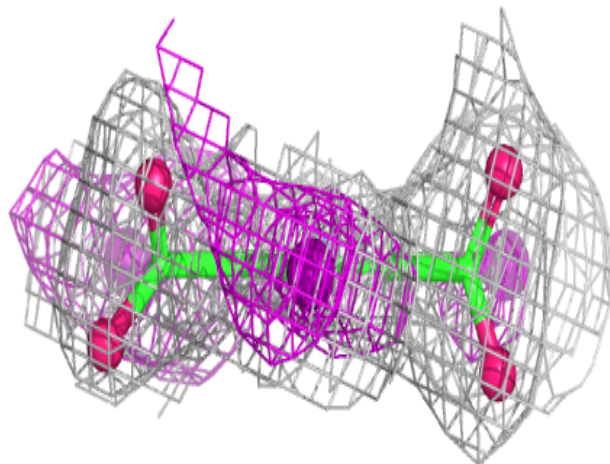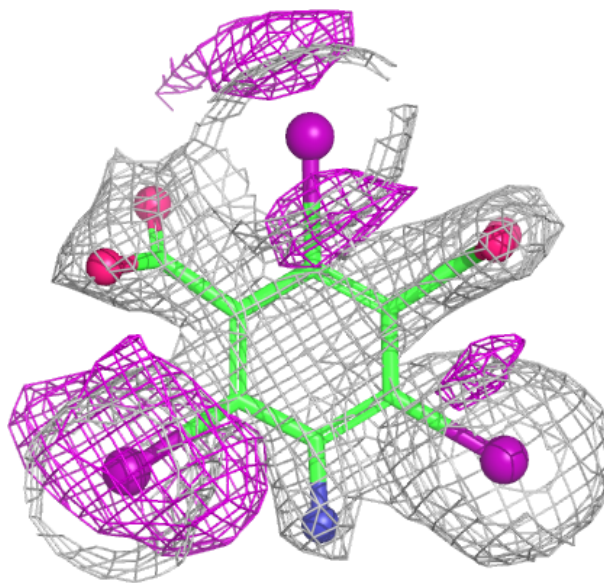$mF_o\text{-}DF_c$ (at 3 rmsd) in purple (negative)
and green (positive)
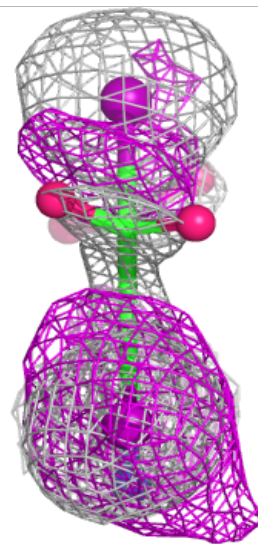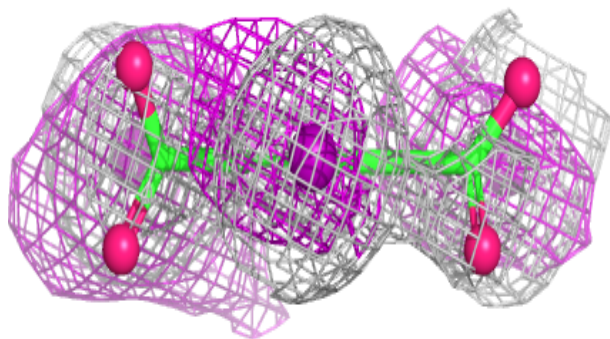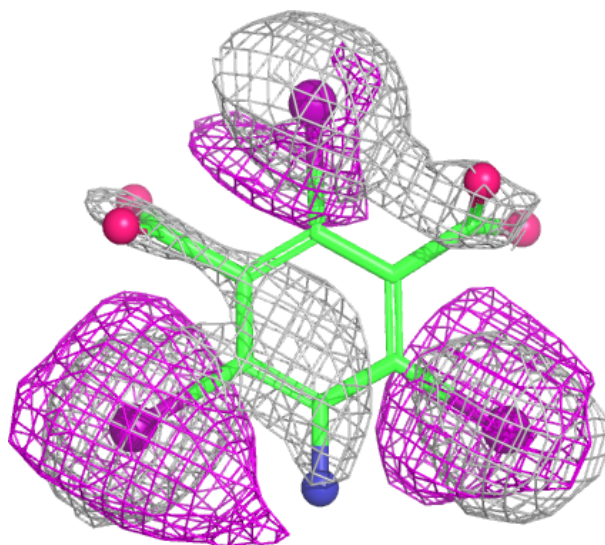
Electron density around I3C E 101:

$2mF_o$-DF_c (at 0.7 rmsd) in gray
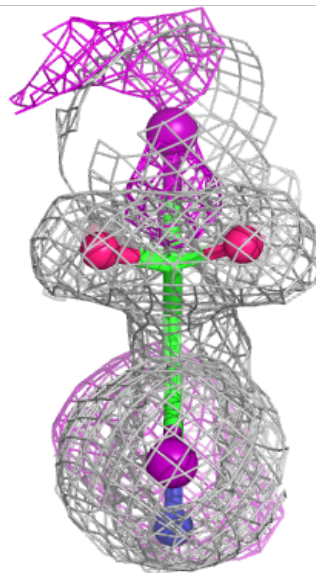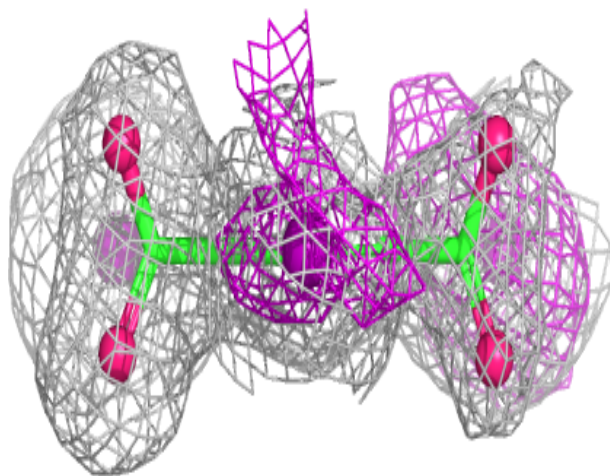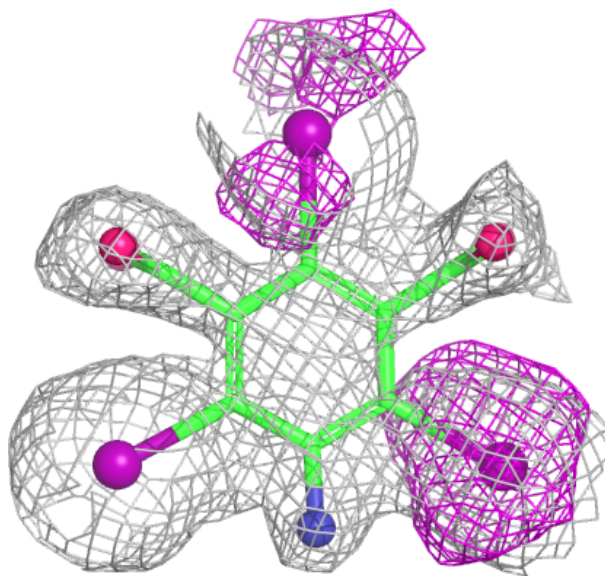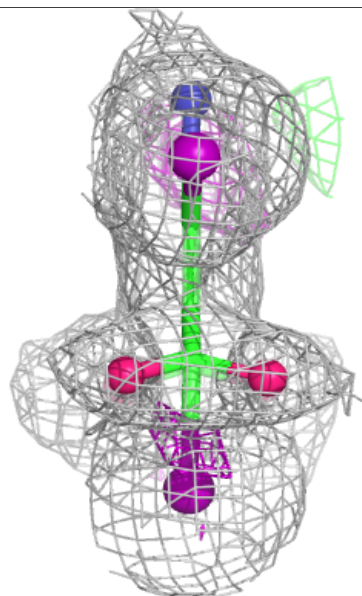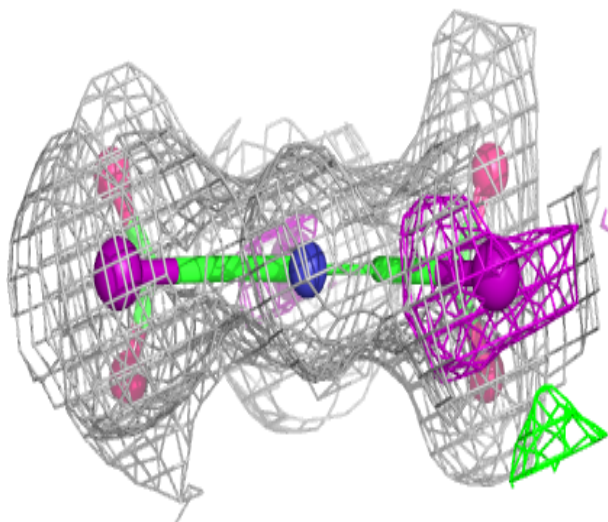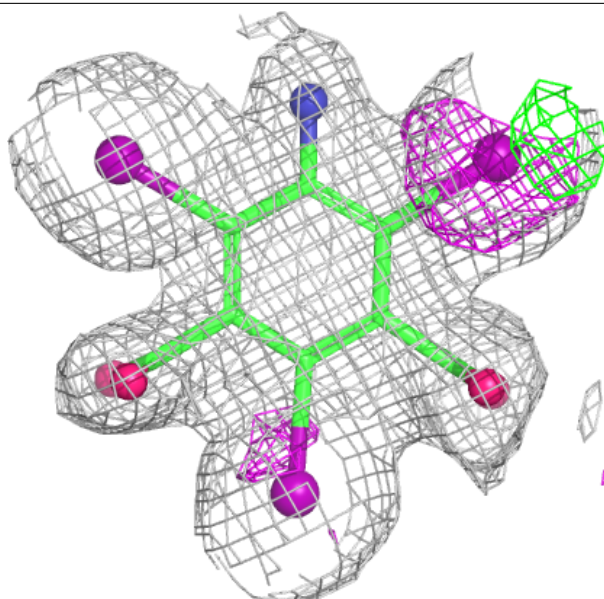mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)
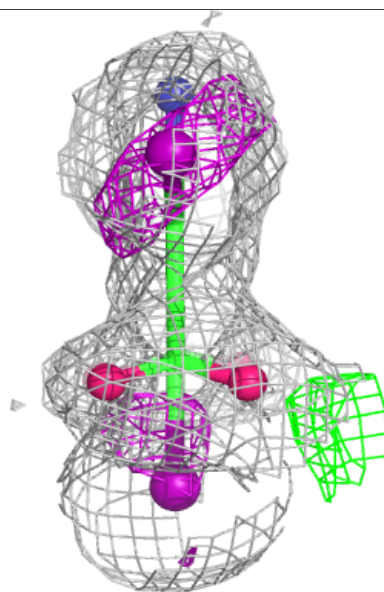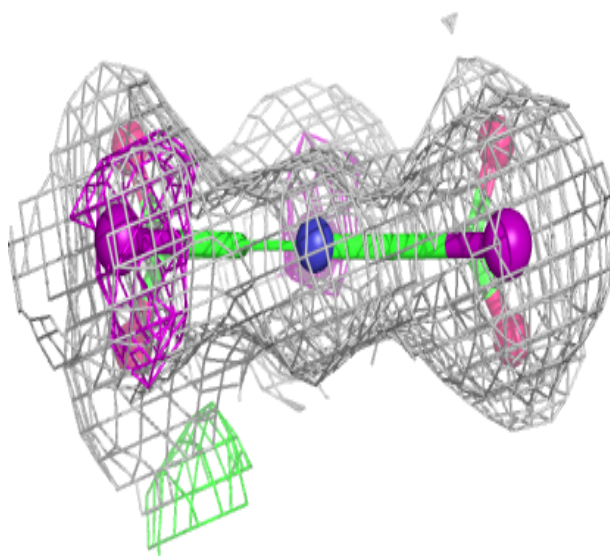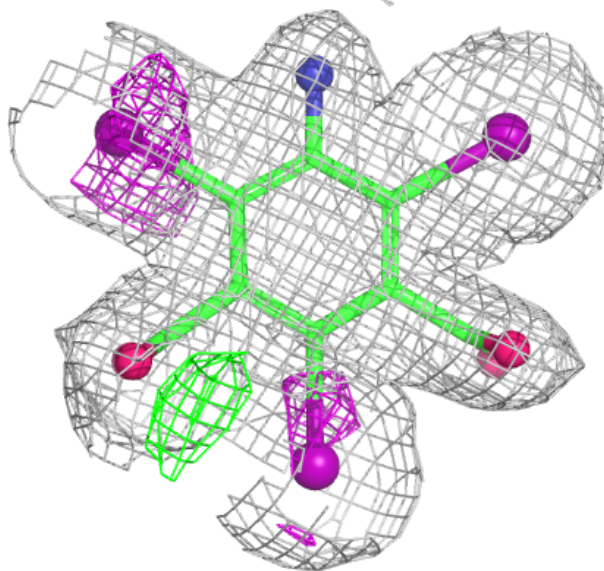
Electron density around I3C C 101:

$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative)
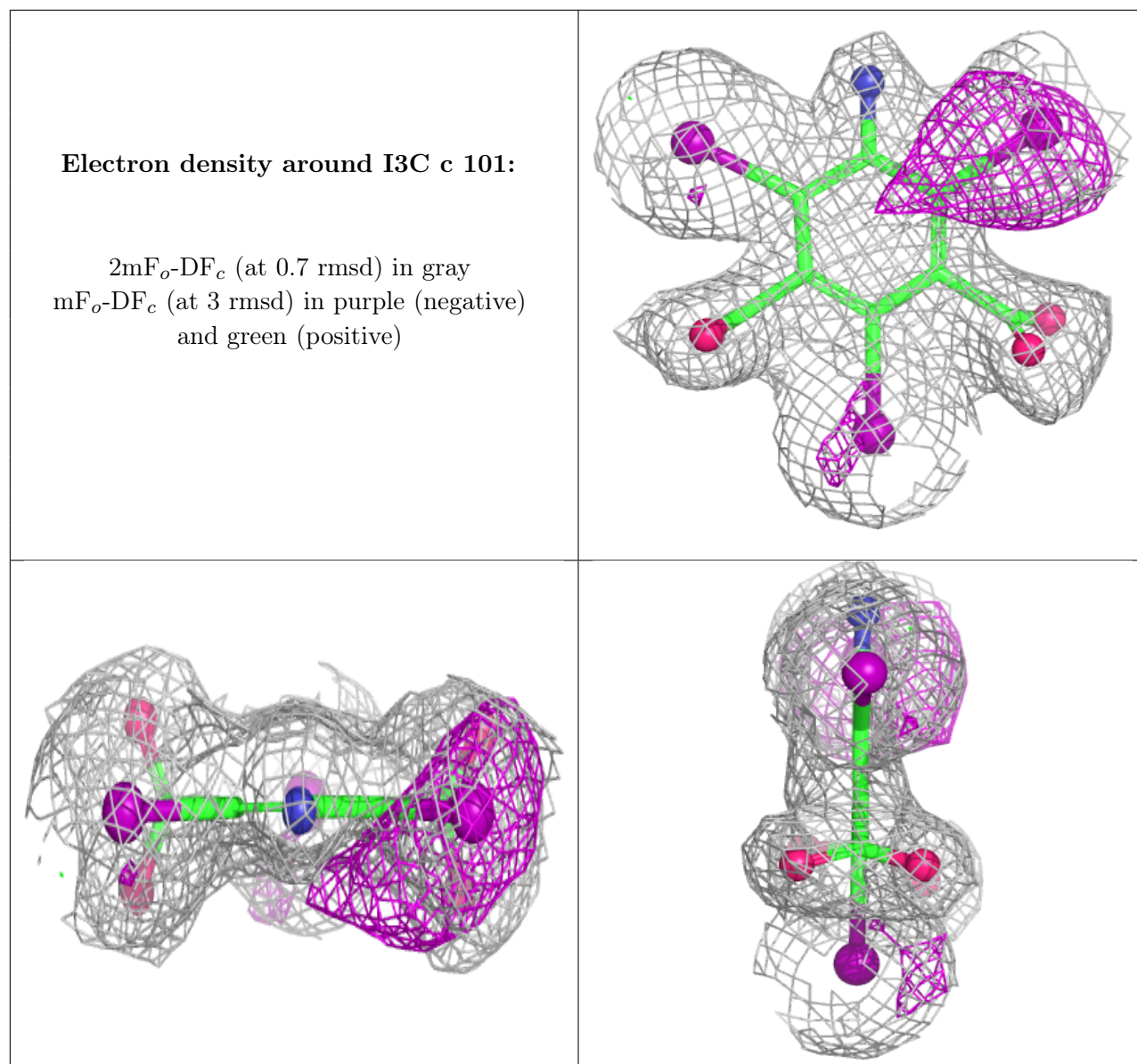and green (positive)
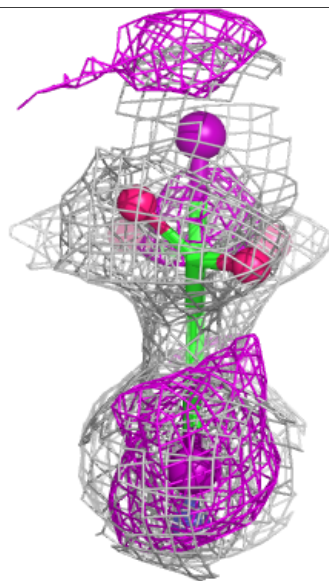
Electron density around I3C D 101:

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

Electron density around I3C B 101:

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

Electron density around I3C c 101:

$2mF_o$-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 ⓘ

There are no such residues in this entry.