



# Full wwPDB X-ray Structure Validation Report ⓘ

Oct 17, 2023 – 04:15 PM EDT

PDB ID : 1XS4  
Title : dCTP deaminase from Escherichia coli- E138A mutant enzyme in complex with dCTP  
Authors : Johansson, E.; Fano, M.; Bynck, J.H.; Neuhard, J.; Larsen, S.; Sigurskjold, B.W.; Christensen, U.; Willemoes, M.  
Deposited on : 2004-10-18  
Resolution : 2.53 Å(reported)

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

We welcome your comments at [validation@mail.wwpdb.org](mailto:validation@mail.wwpdb.org)

A user guide is available at

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

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

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

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

MolProbity : 4.02b-467  
Mogul : 1.8.5 (274361), CSD as541be (2020)  
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

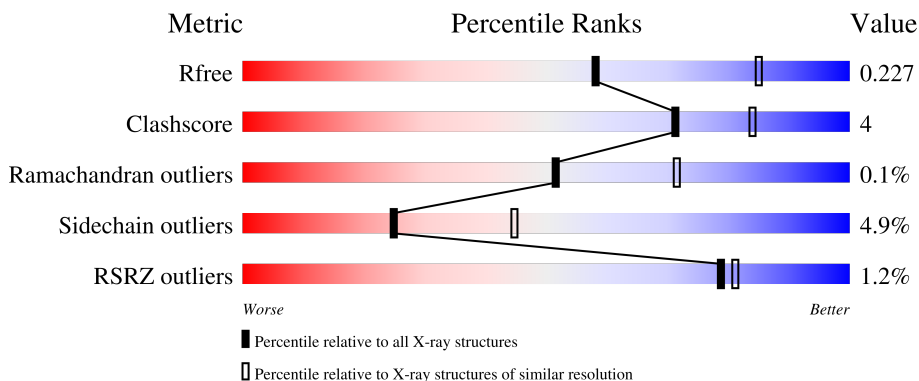
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.53 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	5743 (2.54-2.50)
Clashscore	141614	6463 (2.54-2.50)
Ramachandran outliers	138981	6335 (2.54-2.50)
Sidechain outliers	138945	6337 (2.54-2.50)
RSRZ outliers	127900	5630 (2.54-2.50)

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	193	
1	B	193	
1	C	193	
1	D	193	

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Mol	Chain	Length	Quality of chain
1	E	193	 87% 12% •
1	F	193	 % 87% 12% •

## 2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 9355 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 Deoxycytidine triphosphate deaminase.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
			Total	C	N	O	S	Se			
1	A	193	1492	939	271	276	2	4	0	0	0
1	B	193	1492	939	271	276	2	4	0	0	0
1	C	193	1492	939	271	276	2	4	0	0	0
1	D	193	1492	939	271	276	2	4	0	0	0
1	E	193	1492	939	271	276	2	4	0	0	0
1	F	193	1492	939	271	276	2	4	0	0	0

There are 30 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	1	MSE	MET	modified residue	UNP P28248
A	69	MSE	MET	modified residue	UNP P28248
A	119	MSE	MET	modified residue	UNP P28248
A	138	ALA	GLU	engineered mutation	UNP P28248
A	153	MSE	MET	modified residue	UNP P28248
B	1	MSE	MET	modified residue	UNP P28248
B	69	MSE	MET	modified residue	UNP P28248
B	119	MSE	MET	modified residue	UNP P28248
B	138	ALA	GLU	engineered mutation	UNP P28248
B	153	MSE	MET	modified residue	UNP P28248
C	1	MSE	MET	modified residue	UNP P28248
C	69	MSE	MET	modified residue	UNP P28248
C	119	MSE	MET	modified residue	UNP P28248
C	138	ALA	GLU	engineered mutation	UNP P28248
C	153	MSE	MET	modified residue	UNP P28248
D	1	MSE	MET	modified residue	UNP P28248
D	69	MSE	MET	modified residue	UNP P28248

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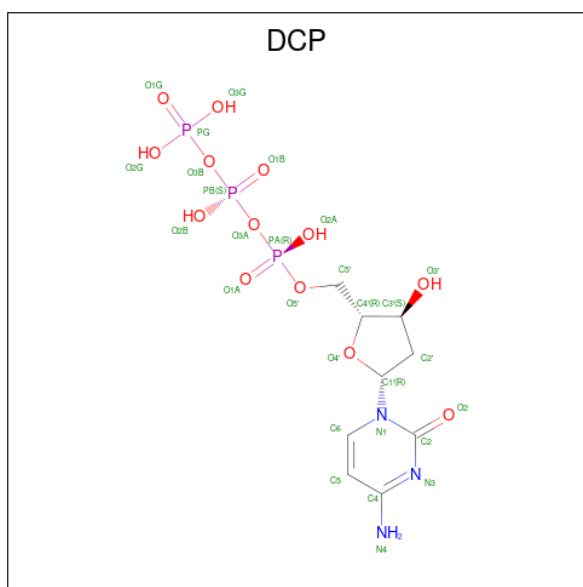
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Chain	Residue	Modelled	Actual	Comment	Reference
D	119	MSE	MET	modified residue	UNP P28248
D	138	ALA	GLU	engineered mutation	UNP P28248
D	153	MSE	MET	modified residue	UNP P28248
E	1	MSE	MET	modified residue	UNP P28248
E	69	MSE	MET	modified residue	UNP P28248
E	119	MSE	MET	modified residue	UNP P28248
E	138	ALA	GLU	engineered mutation	UNP P28248
E	153	MSE	MET	modified residue	UNP P28248
F	1	MSE	MET	modified residue	UNP P28248
F	69	MSE	MET	modified residue	UNP P28248
F	119	MSE	MET	modified residue	UNP P28248
F	138	ALA	GLU	engineered mutation	UNP P28248
F	153	MSE	MET	modified residue	UNP P28248

- Molecule 2 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	1	Total Mg 1 1	0	0
2	B	1	Total Mg 1 1	0	0
2	C	1	Total Mg 1 1	0	0
2	D	1	Total Mg 1 1	0	0
2	E	1	Total Mg 1 1	0	0
2	F	1	Total Mg 1 1	0	0

- Molecule 3 is 2'-DEOXYCYTIDINE-5'-TRIPHOSPHATE (three-letter code: DCP) (formula: C<sub>9</sub>H<sub>16</sub>N<sub>3</sub>O<sub>13</sub>P<sub>3</sub>).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	P		
3	A	1	Total	C	N	O	P	0	0
			28	9	3	13	3		
3	B	1	Total	C	N	O	P	0	0
			28	9	3	13	3		
3	C	1	Total	C	N	O	P	0	0
			28	9	3	13	3		
3	D	1	Total	C	N	O	P	0	0
			28	9	3	13	3		
3	E	1	Total	C	N	O	P	0	0
			28	9	3	13	3		
3	F	1	Total	C	N	O	P	0	0
			28	9	3	13	3		

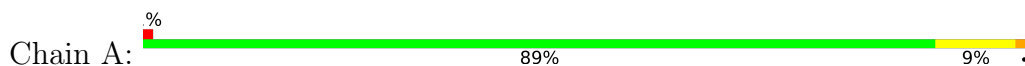
- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	37	Total	O	0	0
			37	37		
4	B	35	Total	O	0	0
			35	35		
4	C	35	Total	O	0	0
			35	35		
4	D	38	Total	O	0	0
			38	38		
4	E	50	Total	O	0	0
			50	50		
4	F	34	Total	O	0	0
			34	34		

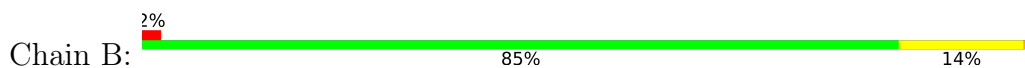
### 3 Residue-property plots [i](#)

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.

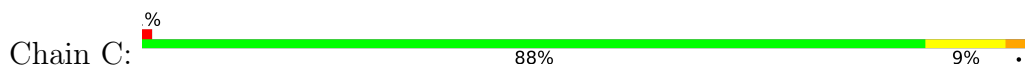
- Molecule 1: Deoxycytidine triphosphate deaminase



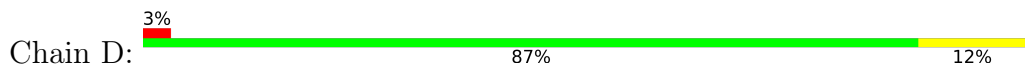
- Molecule 1: Deoxycytidine triphosphate deaminase



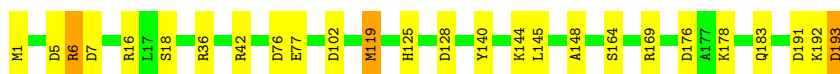
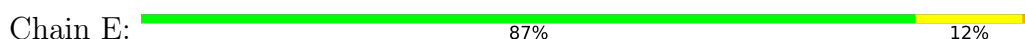
- Molecule 1: Deoxycytidine triphosphate deaminase




- Molecule 1: Deoxycytidine triphosphate deaminase



- Molecule 1: Deoxycytidine triphosphate deaminase



- Molecule 1: Deoxycytidine triphosphate deaminase

Chain F:  %  
87% 12%





## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	63.27Å 97.88Å 95.12Å 90.00° 109.23° 90.00°	Depositor
Resolution (Å)	30.00 – 2.53 29.94 – 2.53	Depositor EDS
% Data completeness (in resolution range)	99.4 (30.00-2.53) 98.6 (29.94-2.53)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	0.05	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	8.63 (at 2.54Å)	Xtrriage
Refinement program	REFMAC 5.1.24	Depositor
R, $R_{free}$	0.185 , 0.225 0.189 , 0.227	Depositor DCC
$R_{free}$ test set	1818 reflections (4.99%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	24.1	Xtrriage
Anisotropy	0.384	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.32 , -4.9	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.48$ , $\langle L^2 \rangle = 0.31$	Xtrriage
Estimated twinning fraction	0.220 for h,-k,-h-l	Xtrriage
$F_o, F_c$ correlation	0.94	EDS
Total number of atoms	9355	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	20.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 7.09% 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: DCP, MG

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	0.86	1/1520 (0.1%)	1.01	9/2056 (0.4%)
1	B	0.86	1/1520 (0.1%)	1.01	9/2056 (0.4%)
1	C	0.82	1/1520 (0.1%)	0.94	8/2056 (0.4%)
1	D	0.84	2/1520 (0.1%)	1.02	12/2056 (0.6%)
1	E	0.89	3/1520 (0.2%)	1.01	10/2056 (0.5%)
1	F	0.88	0/1520	0.98	8/2056 (0.4%)
All	All	0.86	8/9120 (0.1%)	0.99	56/12336 (0.5%)

All (8) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	E	183	GLN	CG-CD	8.06	1.69	1.51
1	E	183	GLN	CB-CG	6.66	1.70	1.52
1	D	144	LYS	CD-CE	5.61	1.65	1.51
1	C	119	MSE	SE-CE	-5.31	1.64	1.95
1	B	119	MSE	SE-CE	-5.28	1.64	1.95
1	A	71	ASP	CB-CG	5.18	1.62	1.51
1	E	119	MSE	SE-CE	-5.03	1.65	1.95
1	D	119	MSE	SE-CE	-5.00	1.66	1.95

All (56) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	F	174	ARG	NE-CZ-NH2	-9.34	115.63	120.30
1	D	36	ARG	NE-CZ-NH1	8.53	124.56	120.30
1	E	193	ASP	CB-CG-OD2	8.51	125.96	118.30
1	B	76	ASP	CB-CG-OD2	8.10	125.59	118.30
1	E	128	ASP	CB-CG-OD2	8.04	125.54	118.30
1	A	71	ASP	CB-CG-OD2	7.95	125.45	118.30
1	A	193	ASP	CB-CG-OD2	7.80	125.32	118.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	7	ASP	CB-CG-OD2	7.59	125.13	118.30
1	A	174	ARG	NE-CZ-NH2	-7.42	116.59	120.30
1	F	7	ASP	CB-CG-OD2	7.38	124.94	118.30
1	C	193	ASP	CB-CG-OD2	7.37	124.93	118.30
1	B	34	ASP	CB-CG-OD2	7.35	124.92	118.30
1	D	13	ASP	CB-CG-OD2	7.28	124.86	118.30
1	E	7	ASP	CB-CG-OD2	6.97	124.57	118.30
1	B	174	ARG	NE-CZ-NH2	-6.87	116.86	120.30
1	D	193	ASP	CB-CG-OD2	6.85	124.46	118.30
1	F	76	ASP	CB-CG-OD2	6.61	124.25	118.30
1	D	34	ASP	CB-CG-OD2	6.57	124.21	118.30
1	B	176	ASP	CB-CG-OD2	6.49	124.14	118.30
1	C	59	ASP	CB-CG-OD2	6.48	124.14	118.30
1	B	66	ASP	CB-CG-OD2	6.47	124.12	118.30
1	F	71	ASP	CB-CG-OD2	6.47	124.12	118.30
1	F	174	ARG	NE-CZ-NH1	6.46	123.53	120.30
1	C	174	ARG	NE-CZ-NH2	-6.45	117.07	120.30
1	D	7	ASP	CB-CG-OD2	6.42	124.08	118.30
1	C	174	ARG	NE-CZ-NH1	6.41	123.51	120.30
1	E	176	ASP	CB-CG-OD2	6.37	124.03	118.30
1	D	174	ARG	NE-CZ-NH2	-6.24	117.18	120.30
1	E	102	ASP	CB-CG-OD2	6.21	123.89	118.30
1	C	71	ASP	CB-CG-OD2	6.08	123.77	118.30
1	A	76	ASP	CB-CG-OD2	6.01	123.71	118.30
1	C	66	ASP	CB-CG-OD2	5.99	123.69	118.30
1	E	5	ASP	CB-CG-OD2	5.99	123.69	118.30
1	B	13	ASP	CB-CG-OD2	5.93	123.64	118.30
1	B	174	ARG	NE-CZ-NH1	5.93	123.26	120.30
1	D	176	ASP	CB-CG-OD2	5.92	123.63	118.30
1	E	191	ASP	CB-CG-OD2	5.79	123.51	118.30
1	B	36	ARG	NE-CZ-NH1	5.77	123.19	120.30
1	C	128	ASP	CB-CG-OD2	5.77	123.50	118.30
1	D	108	ASP	CB-CG-OD2	5.75	123.48	118.30
1	D	174	ARG	NE-CZ-NH1	5.67	123.13	120.30
1	D	128	ASP	CB-CG-OD2	5.66	123.39	118.30
1	E	76	ASP	CB-CG-OD2	5.64	123.37	118.30
1	A	6	ARG	NE-CZ-NH1	5.54	123.07	120.30
1	D	66	ASP	CB-CG-OD2	5.51	123.26	118.30
1	F	169	ARG	NE-CZ-NH1	5.50	123.05	120.30
1	F	13	ASP	CB-CG-OD2	5.43	123.19	118.30
1	D	36	ARG	NE-CZ-NH2	-5.38	117.61	120.30
1	E	169	ARG	NE-CZ-NH2	-5.35	117.62	120.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	108	ASP	CB-CG-OD2	5.35	123.12	118.30
1	A	174	ARG	NE-CZ-NH1	5.35	122.97	120.30
1	A	150	ARG	NE-CZ-NH1	5.20	122.90	120.30
1	A	102	ASP	CB-CG-OD2	5.17	122.95	118.30
1	F	191	ASP	CB-CG-OD2	5.11	122.90	118.30
1	C	76	ASP	CB-CG-OD2	5.05	122.84	118.30
1	E	36	ARG	NE-CZ-NH1	5.01	122.81	120.30

There are no chirality outliers.

There are no planarity outliers.

## 5.2 Too-close contacts

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	1492	0	1494	13	0
1	B	1492	0	1494	15	0
1	C	1492	0	1494	17	0
1	D	1492	0	1494	13	0
1	E	1492	0	1494	20	0
1	F	1492	0	1494	17	0
2	A	1	0	0	0	0
2	B	1	0	0	0	0
2	C	1	0	0	0	0
2	D	1	0	0	0	0
2	E	1	0	0	0	0
2	F	1	0	0	0	0
3	A	28	0	12	0	0
3	B	28	0	12	0	0
3	C	28	0	12	0	0
3	D	28	0	12	0	0
3	E	28	0	12	0	0
3	F	28	0	12	0	0
4	A	37	0	0	0	0
4	B	35	0	0	0	0
4	C	35	0	0	1	0
4	D	38	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
4	E	50	0	0	0	0
4	F	34	0	0	0	0
All	All	9355	0	9036	64	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 4.

All (64) 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:C:1:MSE:SE	1:C:1:MSE:CE	2.15	1.45
1:B:178:LYS:NZ	1:B:193:ASP:OD2	1.93	0.99
1:F:119:MSE:HE2	1:F:140:TYR:HB3	1.52	0.91
1:D:178:LYS:NZ	1:D:193:ASP:OD2	2.03	0.89
1:A:119:MSE:HE2	1:A:140:TYR:HB3	1.55	0.89
1:C:178:LYS:NZ	1:C:193:ASP:OD2	2.06	0.88
1:E:1:MSE:N	1:F:1:MSE:N	2.22	0.88
1:E:178:LYS:NZ	1:E:193:ASP:OD2	2.08	0.87
1:F:178:LYS:NZ	1:F:193:ASP:OD2	2.07	0.86
1:E:1:MSE:H1	1:F:1:MSE:H1	1.25	0.85
1:E:119:MSE:HE2	1:E:140:TYR:HB3	1.58	0.85
1:E:1:MSE:H1	1:F:1:MSE:N	1.75	0.84
1:B:119:MSE:HE2	1:B:140:TYR:HB3	1.57	0.84
1:D:119:MSE:HE2	1:D:140:TYR:HB3	1.57	0.84
1:A:1:MSE:H1	1:B:1:MSE:H3	1.26	0.80
1:C:119:MSE:HE2	1:C:140:TYR:HB3	1.64	0.80
1:A:178:LYS:NZ	1:A:193:ASP:OD2	2.20	0.75
1:D:1:MSE:HE1	1:E:164:SER:HB3	1.72	0.70
1:A:1:MSE:H1	1:B:1:MSE:N	1.93	0.67
1:E:144:LYS:HE3	1:F:87:GLU:OE1	1.95	0.65
1:A:1:MSE:N	1:C:1:MSE:H2	1.96	0.63
1:D:1:MSE:N	1:E:1:MSE:N	2.48	0.62
1:E:1:MSE:N	1:F:1:MSE:H3	1.99	0.60
1:E:1:MSE:H2	1:F:1:MSE:N	2.00	0.59
1:B:1:MSE:H3	1:C:1:MSE:N	2.04	0.56
1:E:1:MSE:H2	1:F:1:MSE:H3	1.54	0.55
1:D:1:MSE:H1	1:E:1:MSE:N	2.05	0.54
1:B:1:MSE:N	1:C:1:MSE:H2	2.06	0.54
1:D:1:MSE:N	1:E:1:MSE:H3	2.06	0.54
1:A:1:MSE:N	1:B:1:MSE:N	2.56	0.53
1:F:119:MSE:CE	1:F:140:TYR:HB3	2.34	0.53

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:1:MSE:H3	1:C:1:MSE:H2	1.56	0.52
1:E:148:ALA:HB3	1:F:53:ASP:HA	1.92	0.51
1:A:169:ARG:HD2	4:C:3229:HOH:O	2.10	0.51
1:B:1:MSE:N	1:C:1:MSE:N	2.59	0.51
1:A:53:ASP:HA	1:C:148:ALA:HB3	1.93	0.50
1:C:63:ALA:HB1	1:C:67:ARG:HH12	1.75	0.50
1:E:119:MSE:CE	1:E:140:TYR:HB3	2.37	0.50
1:A:119:MSE:CE	1:A:140:TYR:HB3	2.36	0.49
1:D:1:MSE:N	1:F:1:MSE:N	2.60	0.49
1:C:87:GLU:OE2	1:E:144:LYS:NZ	2.46	0.48
1:B:144:LYS:HE3	1:C:87:GLU:OE1	2.14	0.47
1:C:63:ALA:HB1	1:C:67:ARG:NH1	2.29	0.47
1:F:4:CYS:O	1:F:8:ILE:HG13	2.15	0.47
1:A:65:LEU:O	1:A:69:MSE:HG2	2.15	0.47
1:B:11:TRP:CH2	1:B:16:ARG:CZ	2.97	0.47
1:C:119:MSE:CE	1:C:140:TYR:HB3	2.41	0.47
1:D:5:ASP:O	1:D:9:GLU:HG3	2.15	0.46
1:A:1:MSE:H1	1:C:1:MSE:H2	1.61	0.46
1:B:150:ARG:NH1	1:C:53:ASP:OD2	2.48	0.46
1:A:36:ARG:HG2	1:A:152:GLY:O	2.16	0.45
1:D:1:MSE:N	1:F:1:MSE:H1	2.15	0.45
1:B:119:MSE:CE	1:B:140:TYR:HB3	2.37	0.44
1:D:18:SER:HB3	1:D:98:THR:HB	1.99	0.44
1:B:9:GLU:OE2	1:B:25:VAL:HG22	2.18	0.44
1:B:180:ARG:O	1:B:181:ASN:HB2	2.18	0.43
1:D:119:MSE:CE	1:D:140:TYR:HB3	2.38	0.43
1:F:65:LEU:O	1:F:69:MSE:HG2	2.19	0.42
1:E:6:ARG:HD2	1:E:6:ARG:HA	1.95	0.42
1:F:61:VAL:HG12	1:F:191:ASP:HB3	2.01	0.41
1:D:1:MSE:H2	1:E:1:MSE:H3	1.68	0.41
1:E:144:LYS:CE	1:F:87:GLU:OE1	2.67	0.41
1:D:1:MSE:N	1:E:1:MSE:H1	2.18	0.41
1:A:1:MSE:H3	1:C:1:MSE:H2	1.67	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	191/193 (99%)	186 (97%)	5 (3%)	0	100	100
1	B	191/193 (99%)	187 (98%)	4 (2%)	0	100	100
1	C	191/193 (99%)	184 (96%)	6 (3%)	1 (0%)	29	47
1	D	191/193 (99%)	186 (97%)	5 (3%)	0	100	100
1	E	191/193 (99%)	184 (96%)	7 (4%)	0	100	100
1	F	191/193 (99%)	184 (96%)	7 (4%)	0	100	100
All	All	1146/1158 (99%)	1111 (97%)	34 (3%)	1 (0%)	51	71

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	76	ASP

### 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	157/153 (103%)	150 (96%)	7 (4%)	27	48
1	B	157/153 (103%)	150 (96%)	7 (4%)	27	48
1	C	157/153 (103%)	148 (94%)	9 (6%)	20	37
1	D	157/153 (103%)	149 (95%)	8 (5%)	24	43
1	E	157/153 (103%)	149 (95%)	8 (5%)	24	43
1	F	157/153 (103%)	150 (96%)	7 (4%)	27	48

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
All	All	942/918 (103%)	896 (95%)	46 (5%)	25 45

All (46) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	18	SER
1	A	36	ARG
1	A	71	ASP
1	A	125	HIS
1	A	145	LEU
1	A	174	ARG
1	A	183	GLN
1	B	17	LEU
1	B	18	SER
1	B	59	ASP
1	B	62	SER
1	B	125	HIS
1	B	145	LEU
1	B	175	GLU
1	C	1	MSE
1	C	16	ARG
1	C	18	SER
1	C	26	GLU
1	C	59	ASP
1	C	60	GLU
1	C	77	GLU
1	C	125	HIS
1	C	145	LEU
1	D	1	MSE
1	D	17	LEU
1	D	60	GLU
1	D	62	SER
1	D	77	GLU
1	D	125	HIS
1	D	145	LEU
1	D	173	ARG
1	E	6	ARG
1	E	16	ARG
1	E	18	SER
1	E	42	ARG
1	E	77	GLU
1	E	125	HIS

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Mol	Chain	Res	Type
1	E	145	LEU
1	E	192	LYS
1	F	1	MSE
1	F	6	ARG
1	F	14	GLU
1	F	55	SER
1	F	125	HIS
1	F	145	LEU
1	F	175	GLU

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

Mol	Chain	Res	Type
1	B	125	HIS
1	C	183	GLN
1	D	125	HIS
1	E	125	HIS
1	F	125	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](#)

There are no monosaccharides in this entry.

### 5.6 Ligand geometry [i](#)

Of 12 ligands modelled in this entry, 6 are monoatomic - leaving 6 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
3	DCP	B	2194	2	25,29,29	1.02	1 (4%)	37,45,45	1.58	4 (10%)
3	DCP	F	6194	2	25,29,29	1.17	2 (8%)	37,45,45	1.57	5 (13%)
3	DCP	D	4194	2	25,29,29	1.00	1 (4%)	37,45,45	1.60	7 (18%)
3	DCP	E	5194	2	25,29,29	1.24	2 (8%)	37,45,45	1.71	6 (16%)
3	DCP	C	3194	2	25,29,29	1.12	2 (8%)	37,45,45	1.63	6 (16%)
3	DCP	A	1194	2	25,29,29	1.22	3 (12%)	37,45,45	1.56	4 (10%)

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
3	DCP	B	2194	2	-	4/22/34/34	0/2/2/2
3	DCP	F	6194	2	-	4/22/34/34	0/2/2/2
3	DCP	D	4194	2	-	4/22/34/34	0/2/2/2
3	DCP	E	5194	2	-	4/22/34/34	0/2/2/2
3	DCP	C	3194	2	-	4/22/34/34	0/2/2/2
3	DCP	A	1194	2	-	3/22/34/34	0/2/2/2

All (11) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	F	6194	DCP	PG-O1G	2.79	1.59	1.50
3	A	1194	DCP	PG-O1G	2.78	1.59	1.50
3	C	3194	DCP	PG-O1G	2.64	1.59	1.50
3	E	5194	DCP	PG-O1G	2.55	1.58	1.50
3	F	6194	DCP	PB-O1B	2.54	1.59	1.50
3	E	5194	DCP	PB-O1B	2.49	1.59	1.50
3	B	2194	DCP	PG-O1G	2.42	1.58	1.50
3	A	1194	DCP	PB-O1B	2.37	1.59	1.50
3	C	3194	DCP	PB-O1B	2.36	1.59	1.50
3	D	4194	DCP	PG-O1G	2.28	1.57	1.50
3	A	1194	DCP	C6-C5	2.01	1.39	1.35

All (32) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	1194	DCP	O4'-C1'-N1	5.47	117.63	107.86
3	F	6194	DCP	O4'-C1'-N1	5.30	117.33	107.86
3	B	2194	DCP	O4'-C1'-N1	5.29	117.32	107.86
3	C	3194	DCP	O4'-C1'-N1	5.09	116.97	107.86
3	D	4194	DCP	O4'-C1'-N1	4.96	116.74	107.86
3	E	5194	DCP	O2-C2-N3	-4.85	114.44	122.33
3	E	5194	DCP	O4'-C1'-N1	4.59	116.06	107.86
3	C	3194	DCP	O2-C2-N3	-3.67	116.36	122.33
3	A	1194	DCP	C2'-C1'-N1	-3.55	105.60	113.77
3	B	2194	DCP	C2'-C1'-N1	-3.54	105.61	113.77
3	C	3194	DCP	C2'-C1'-N1	-3.53	105.65	113.77
3	D	4194	DCP	C2'-C1'-N1	-3.44	105.85	113.77
3	F	6194	DCP	C2'-C1'-N1	-3.37	106.01	113.77
3	F	6194	DCP	O3G-PG-O3B	3.21	115.39	104.64
3	B	2194	DCP	PB-O3A-PA	-3.15	122.03	132.83
3	E	5194	DCP	O2-C2-N1	2.96	125.01	118.89
3	D	4194	DCP	PB-O3A-PA	-2.96	122.67	132.83
3	F	6194	DCP	PB-O3B-PG	-2.94	122.75	132.83
3	E	5194	DCP	C2'-C1'-N1	-2.88	107.13	113.77
3	E	5194	DCP	PB-O3B-PG	-2.73	123.45	132.83
3	A	1194	DCP	PB-O3B-PG	-2.68	123.63	132.83
3	D	4194	DCP	O2-C2-N3	-2.55	118.19	122.33
3	F	6194	DCP	C3'-C2'-C1'	2.53	108.87	102.54
3	E	5194	DCP	C3'-C2'-C1'	2.42	108.59	102.54
3	C	3194	DCP	PB-O3A-PA	-2.37	124.69	132.83
3	D	4194	DCP	O3G-PG-O3B	2.23	112.10	104.64
3	D	4194	DCP	PB-O3B-PG	-2.22	125.20	132.83
3	C	3194	DCP	PB-O3B-PG	-2.22	125.21	132.83
3	A	1194	DCP	O2-C2-N3	-2.11	118.89	122.33
3	C	3194	DCP	O3'-C3'-C4'	2.08	118.07	110.10
3	D	4194	DCP	C1'-N1-C2	2.05	121.33	117.74
3	B	2194	DCP	O2-C2-N3	-2.04	119.02	122.33

There are no chirality outliers.

All (23) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	B	2194	DCP	PA-O3A-PB-O1B
3	D	4194	DCP	PG-O3B-PB-O1B
3	A	1194	DCP	PG-O3B-PB-O2B
3	E	5194	DCP	PA-O3A-PB-O1B
3	A	1194	DCP	PA-O3A-PB-O1B
3	B	2194	DCP	PG-O3B-PB-O2B

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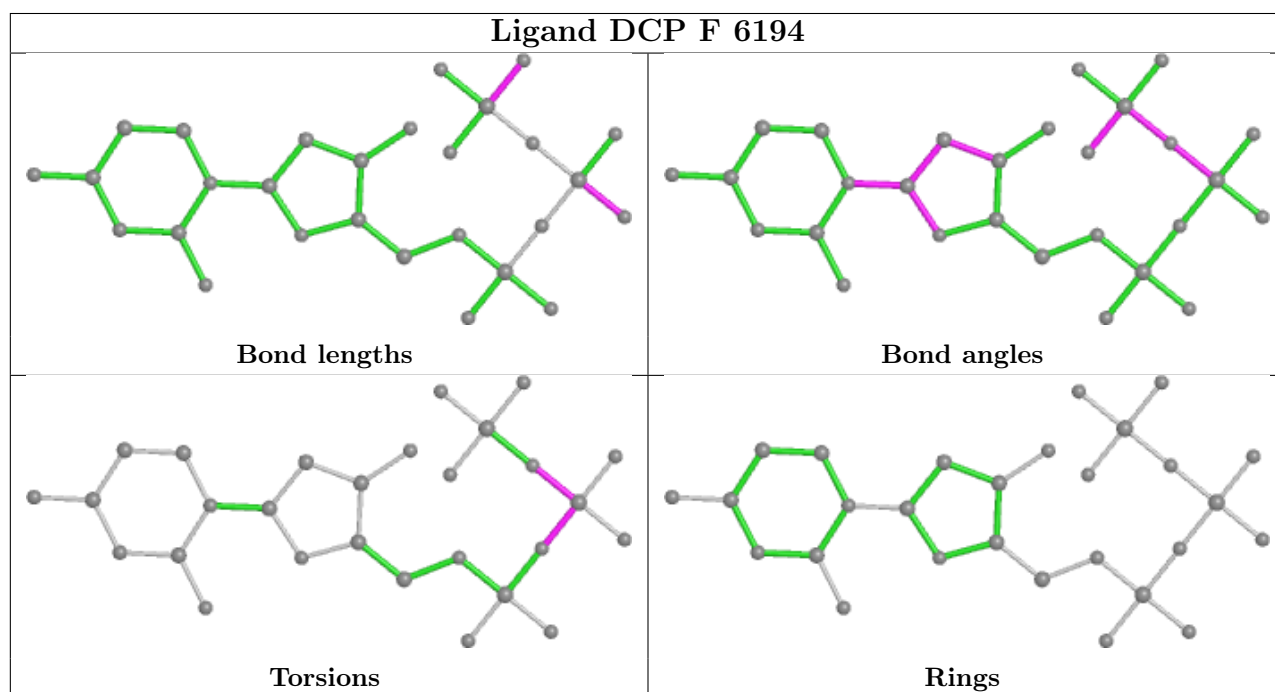
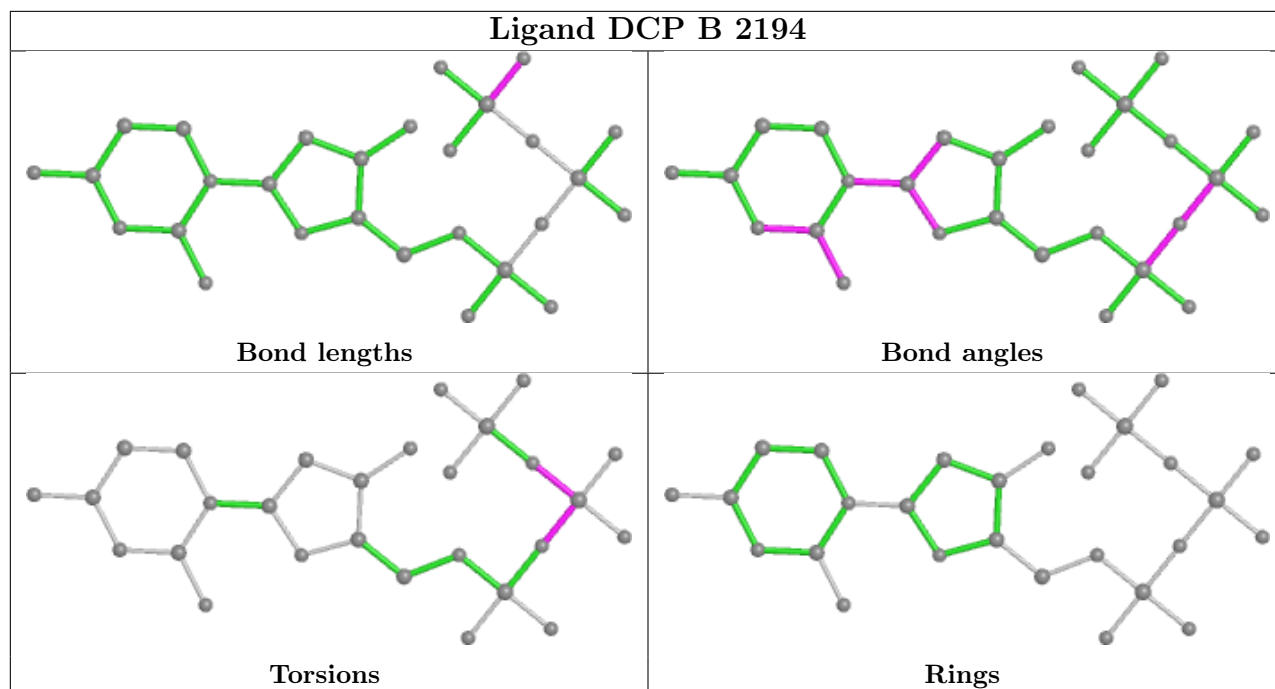
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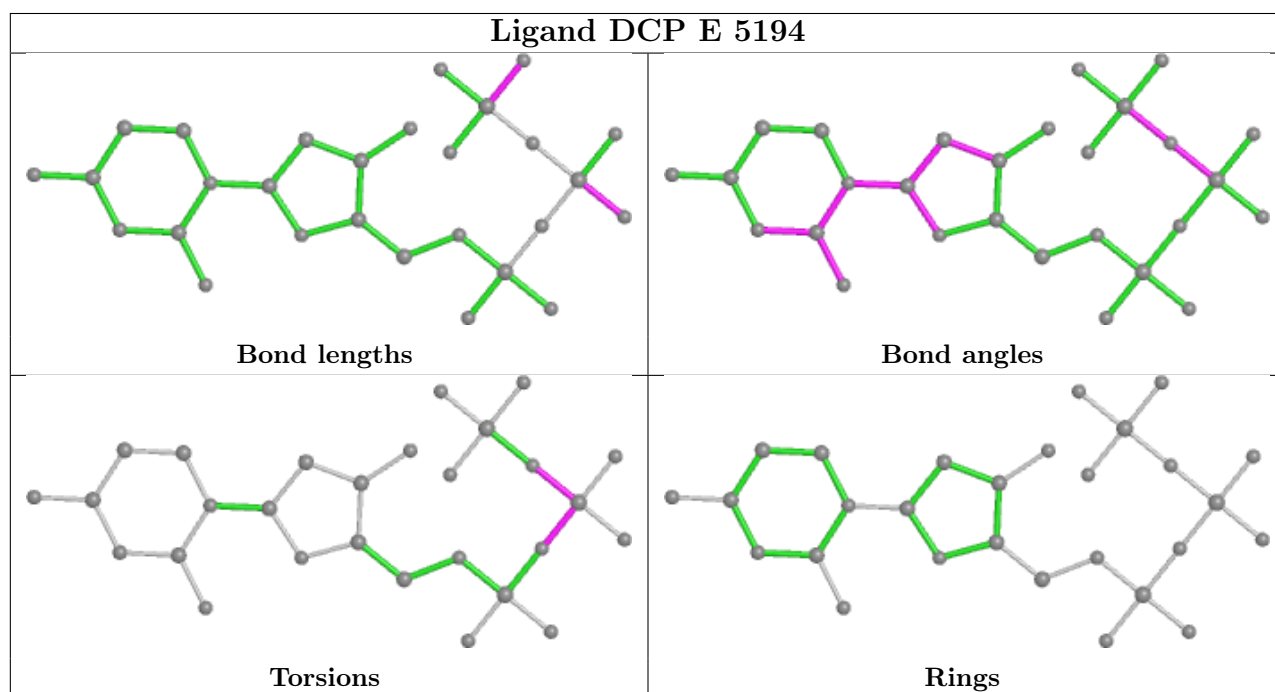
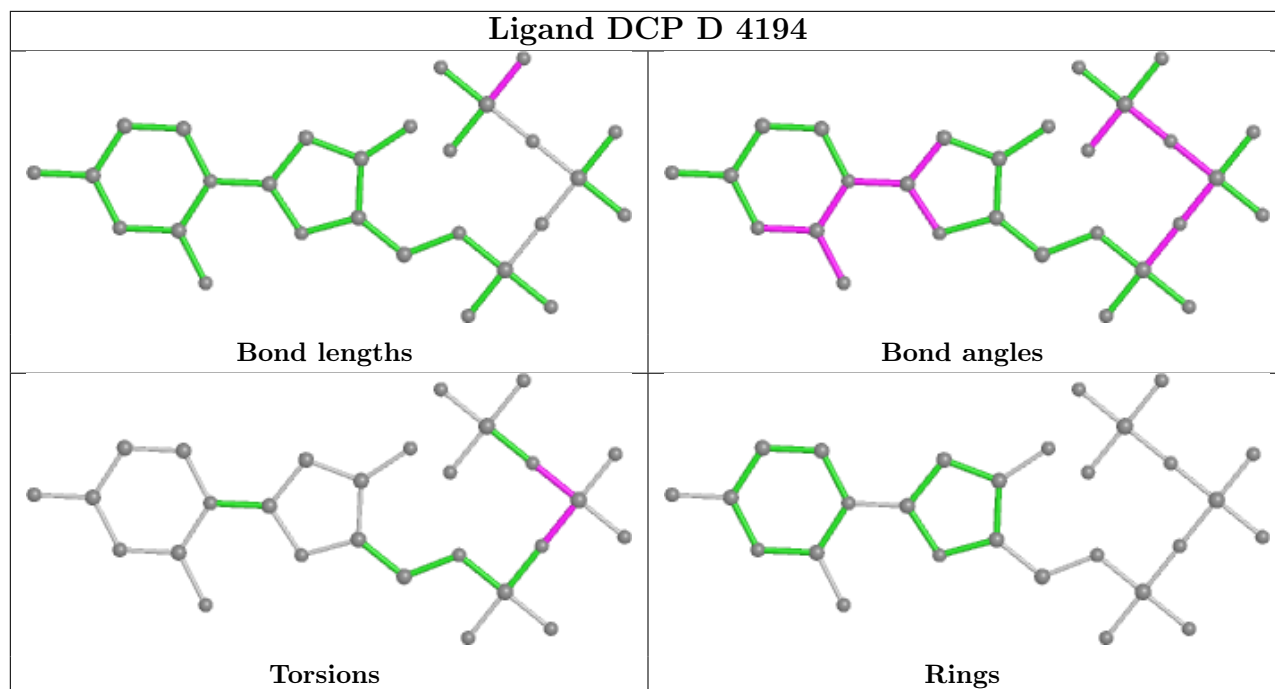
Mol	Chain	Res	Type	Atoms
3	C	3194	DCP	PA-O3A-PB-O1B
3	C	3194	DCP	PG-O3B-PB-O1B
3	C	3194	DCP	PG-O3B-PB-O2B
3	D	4194	DCP	PA-O3A-PB-O2B
3	D	4194	DCP	PG-O3B-PB-O2B
3	E	5194	DCP	PG-O3B-PB-O2B
3	F	6194	DCP	PA-O3A-PB-O1B
3	F	6194	DCP	PA-O3A-PB-O2B
3	F	6194	DCP	PG-O3B-PB-O1B
3	F	6194	DCP	PG-O3B-PB-O2B
3	D	4194	DCP	PA-O3A-PB-O1B
3	E	5194	DCP	PG-O3B-PB-O1B
3	A	1194	DCP	PG-O3B-PB-O1B
3	B	2194	DCP	PA-O3A-PB-O2B
3	B	2194	DCP	PG-O3B-PB-O1B
3	C	3194	DCP	PA-O3A-PB-O2B
3	E	5194	DCP	PA-O3A-PB-O2B

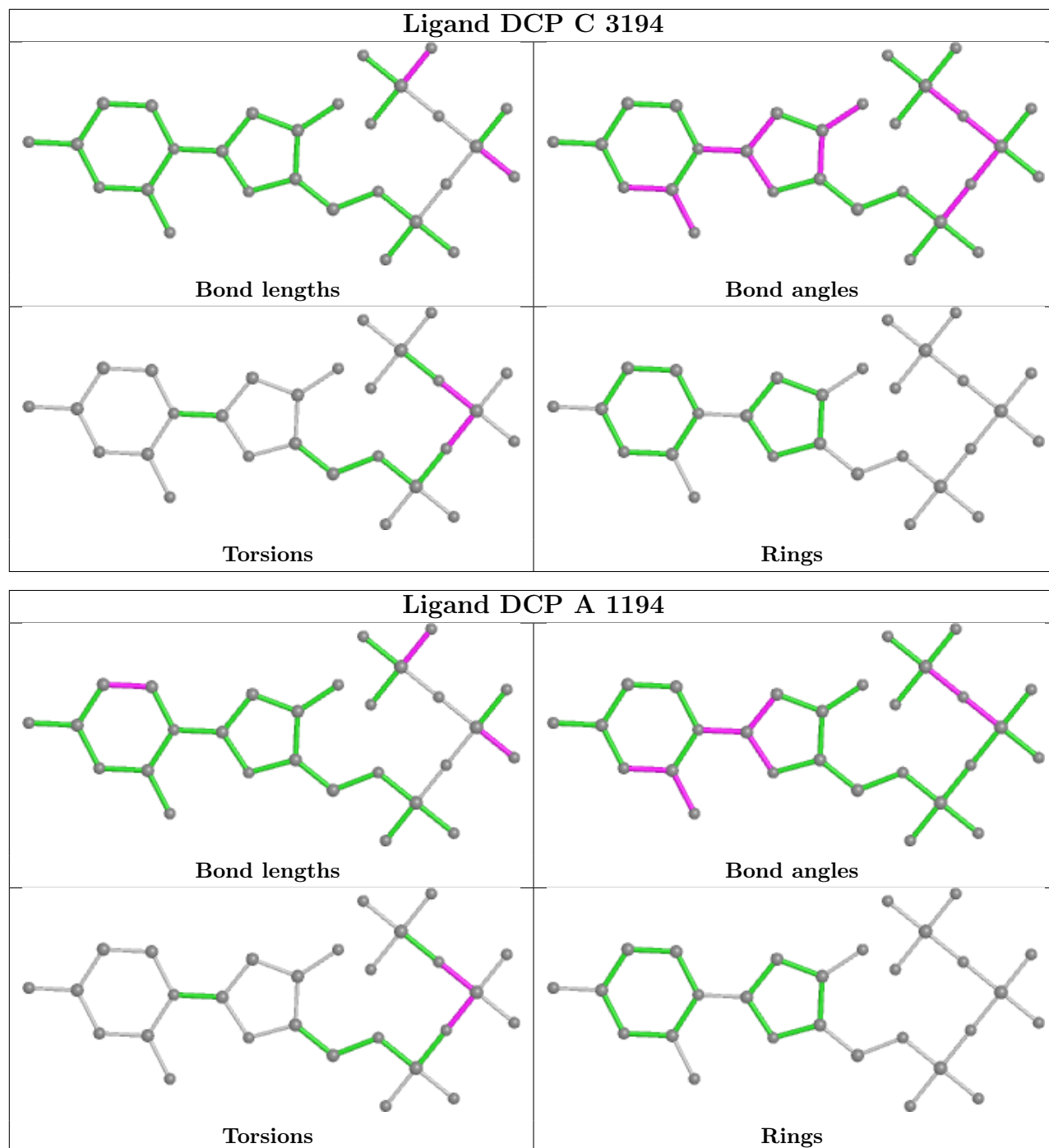
There are no ring outliers.

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 [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	189/193 (97%)	-0.36	2 (1%) 80 83	12, 19, 32, 43	0
1	B	189/193 (97%)	-0.45	4 (2%) 63 67	10, 19, 33, 47	0
1	C	189/193 (97%)	-0.39	1 (0%) 91 92	12, 19, 34, 44	0
1	D	189/193 (97%)	-0.37	5 (2%) 56 59	12, 19, 34, 47	0
1	E	189/193 (97%)	-0.45	0 100 100	8, 19, 32, 40	0
1	F	189/193 (97%)	-0.45	2 (1%) 80 83	12, 19, 32, 44	0
All	All	1134/1158 (97%)	-0.41	14 (1%) 79 81	8, 19, 33, 47	0

All (14) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	183	GLN	4.9
1	D	183	GLN	3.8
1	A	181	ASN	3.7
1	D	181	ASN	3.3
1	B	181	ASN	3.1
1	F	181	ASN	3.1
1	F	77	GLU	3.0
1	A	183	GLN	2.9
1	D	77	GLU	2.6
1	B	77	GLU	2.6
1	B	76	ASP	2.3
1	C	77	GLU	2.2
1	D	78	GLY	2.1
1	D	76	ASP	2.0

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

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



### 6.3 Carbohydrates [i](#)

There are no monosaccharides in this entry.

### 6.4 Ligands [i](#)

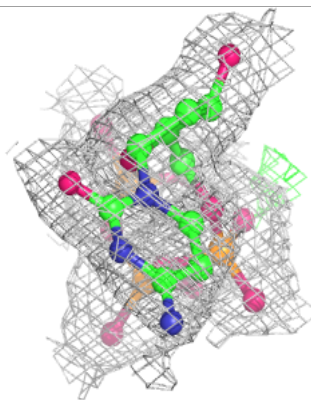
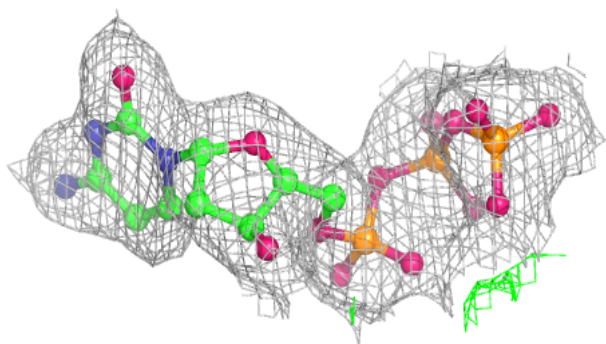
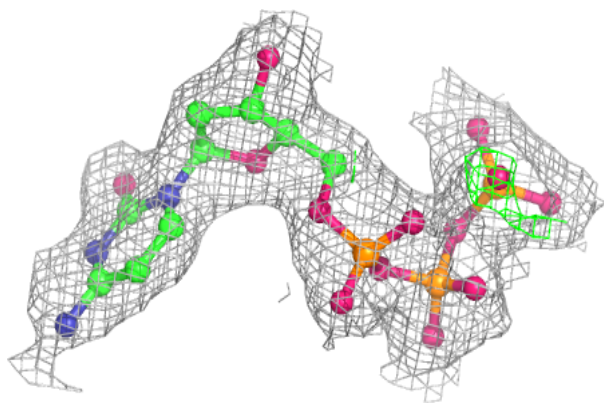
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95<sup>th</sup> percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 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	MG	C	1195	1/1	0.82	0.07	24,24,24,24	0
2	MG	B	3195	1/1	0.84	0.08	24,24,24,24	0
2	MG	F	4195	1/1	0.86	0.16	23,23,23,23	0
2	MG	A	2195	1/1	0.88	0.11	23,23,23,23	0
2	MG	D	5195	1/1	0.93	0.08	23,23,23,23	0
2	MG	E	6195	1/1	0.94	0.07	23,23,23,23	0
3	DCP	D	4194	28/28	0.97	0.10	12,15,16,17	0
3	DCP	E	5194	28/28	0.97	0.10	11,15,16,17	0
3	DCP	C	3194	28/28	0.98	0.10	12,15,16,17	0
3	DCP	A	1194	28/28	0.98	0.09	11,15,16,17	0
3	DCP	B	2194	28/28	0.98	0.09	12,15,16,17	0
3	DCP	F	6194	28/28	0.98	0.09	11,15,16,17	0

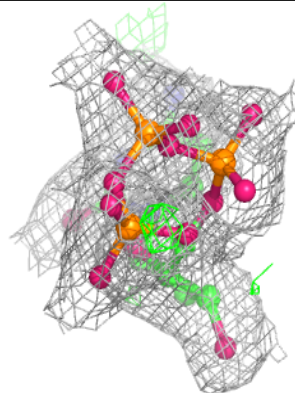
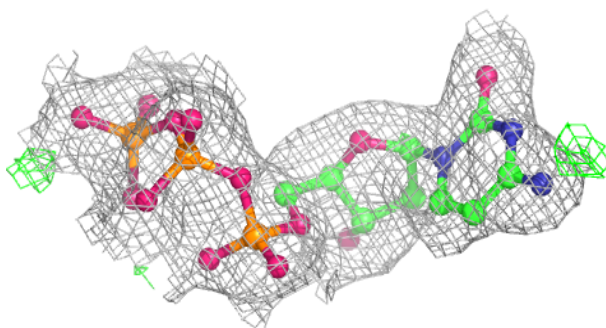
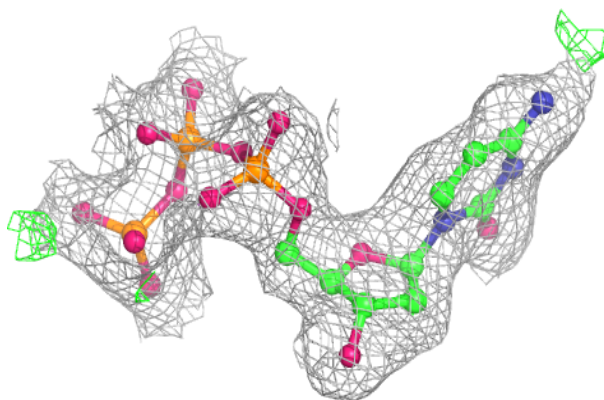
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

**Electron density around DCP D 4194:**

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

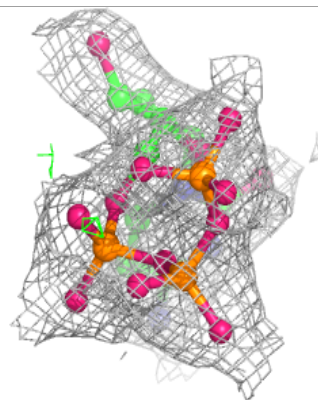
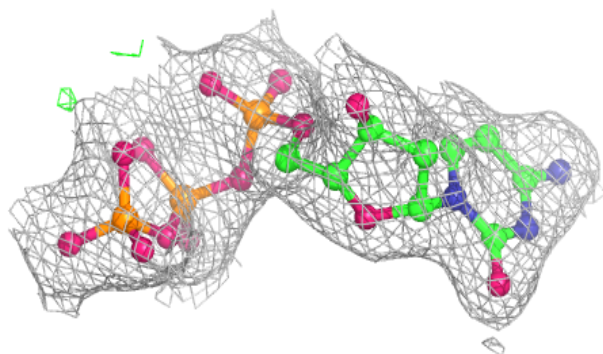
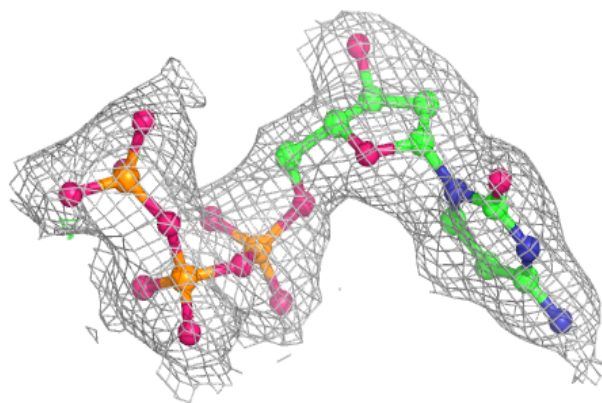
**Electron density around DCP E 5194:**

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

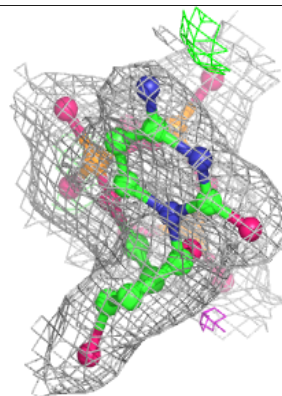
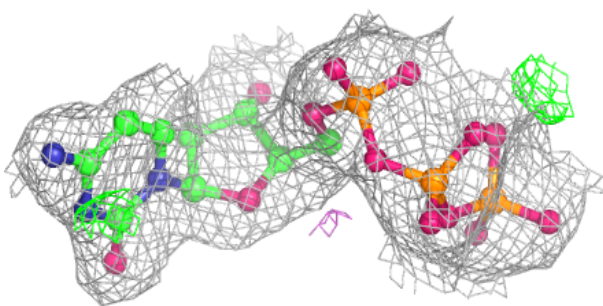
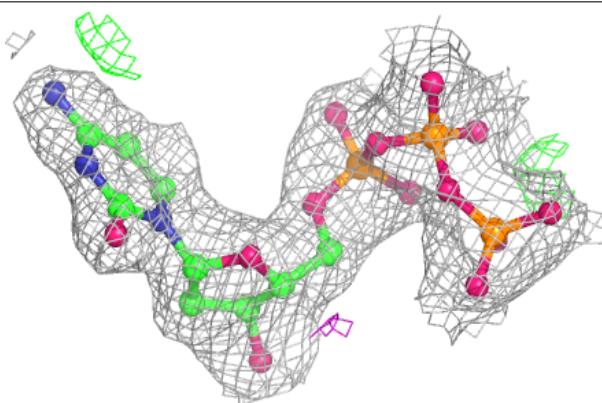


**Electron density around DCP C 3194:**

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

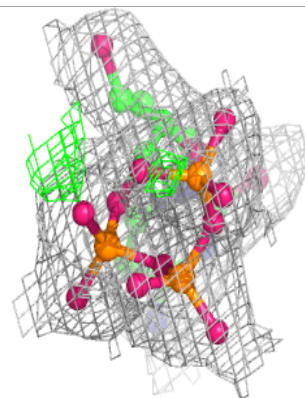
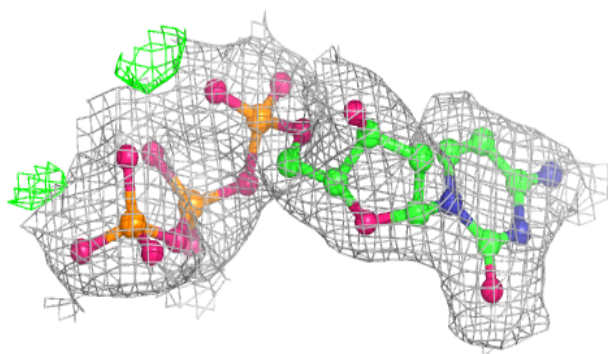
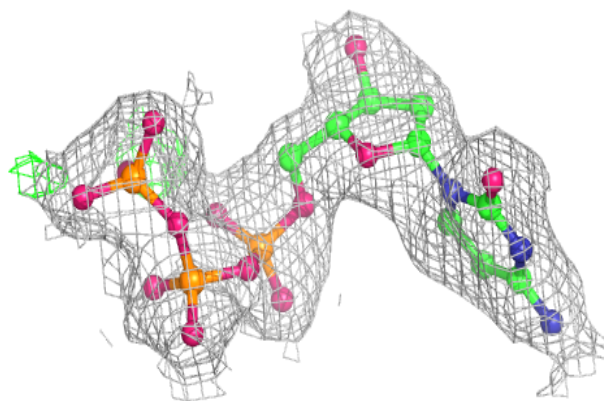
**Electron density around DCP A 1194:**

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

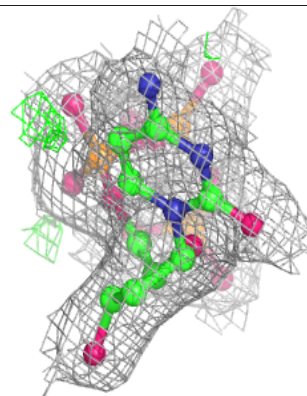
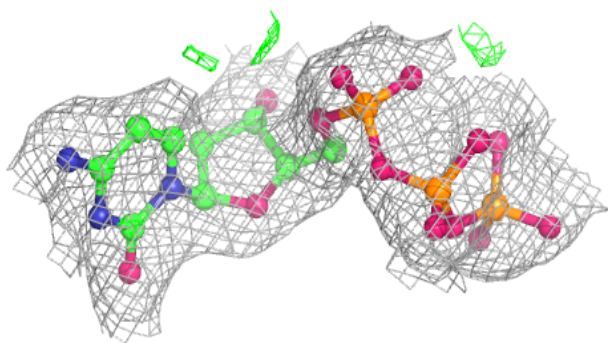
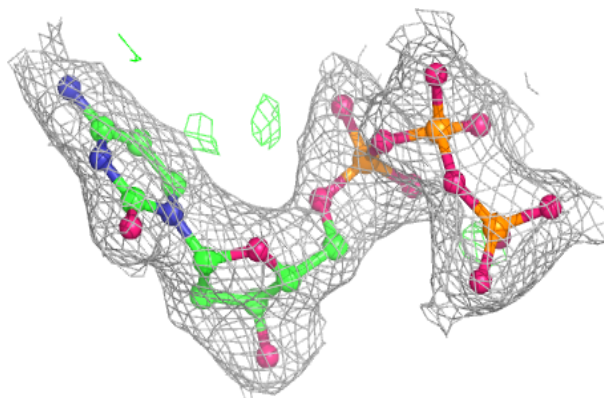


**Electron density around DCP B 2194:**

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

**Electron density around DCP F 6194:**

$2mF_o-DF_c$  (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.