



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 8, 2026 – 07:41 AM UTC

PDB ID : 3PHC / pdb_00003phc
Title : Crystal Structure of Plasmodium falciparum purine nucleoside phosphorylase
in complex with DADMe-ImmG
Authors : Ho, M.; Edwards, A.A.; Almo, S.C.; Schramm, V.L.
Deposited on : 2010-11-03
Resolution : 2.00 Å (reported)

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

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

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 : 4-5-2 with Phenix2.0
Mogul : 2022.3.0, CSD as543be (2022)
Xtrriage (Phenix) : 2.0
EDS : 3.0
Buster-report : wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4 : 9.0.010 (Gargrove)
Density-Fitness : 1.0.12
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

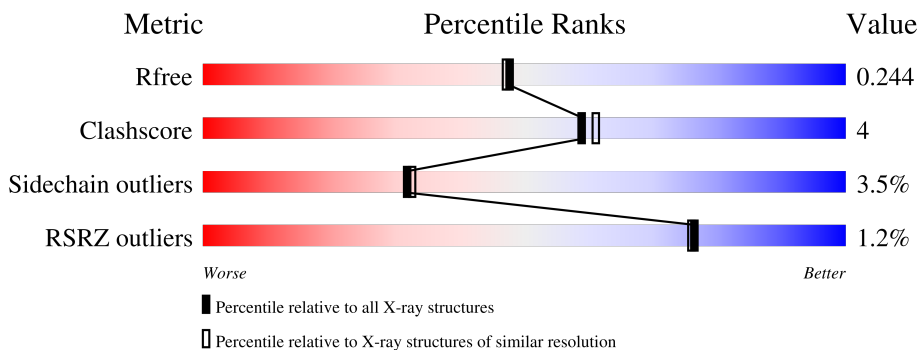
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.00 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}	180053	10052 (2.00-2.00)
Clashscore	190562	11152 (2.00-2.00)
Sidechain outliers	187428	11029 (2.00-2.00)
RSRZ outliers	180081	10067 (2.00-2.00)

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	275	 2% 79% 8% • 12%
1	B	275	 2% 72% 15% • 12%
1	C	275	 2% 78% 10% • 12%
1	D	275	 2% 80% 8% • 12%
1	E	275	 2% 79% 9% • 12%
1	F	275	 2% 78% 9% • 12%

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
3	PO4	E	502	-	-	X	-

2 Entry composition [i](#)

There are 5 unique types of molecules in this entry. The entry contains 11631 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 Purine nucleoside phosphorylase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	243	1861	1179	319	347	16	0	0	0
1	B	243	1861	1179	319	347	16	0	0	0
1	C	243	1861	1179	319	347	16	0	0	0
1	D	243	1861	1179	319	347	16	0	0	0
1	E	243	1861	1179	319	347	16	0	0	0
1	F	243	1861	1179	319	347	16	0	0	0

There are 180 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	1	LEU	-	expression tag	UNP Q8T9Z7
A	246	LYS	-	expression tag	UNP Q8T9Z7
A	247	GLY	-	expression tag	UNP Q8T9Z7
A	248	GLU	-	expression tag	UNP Q8T9Z7
A	249	PHE	-	expression tag	UNP Q8T9Z7
A	250	GLU	-	expression tag	UNP Q8T9Z7
A	251	ALA	-	expression tag	UNP Q8T9Z7
A	252	TYR	-	expression tag	UNP Q8T9Z7
A	253	VAL	-	expression tag	UNP Q8T9Z7
A	254	GLU	-	expression tag	UNP Q8T9Z7
A	255	GLN	-	expression tag	UNP Q8T9Z7
A	256	LYS	-	expression tag	UNP Q8T9Z7
A	257	LEU	-	expression tag	UNP Q8T9Z7
A	258	ILE	-	expression tag	UNP Q8T9Z7
A	259	SER	-	expression tag	UNP Q8T9Z7
A	260	GLU	-	expression tag	UNP Q8T9Z7
A	261	GLU	-	expression tag	UNP Q8T9Z7

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Chain	Residue	Modelled	Actual	Comment	Reference
A	262	ASP	-	expression tag	UNP Q8T9Z7
A	263	LEU	-	expression tag	UNP Q8T9Z7
A	264	ASN	-	expression tag	UNP Q8T9Z7
A	265	SER	-	expression tag	UNP Q8T9Z7
A	266	ALA	-	expression tag	UNP Q8T9Z7
A	267	VAL	-	expression tag	UNP Q8T9Z7
A	268	ASP	-	expression tag	UNP Q8T9Z7
A	269	HIS	-	expression tag	UNP Q8T9Z7
A	270	HIS	-	expression tag	UNP Q8T9Z7
A	271	HIS	-	expression tag	UNP Q8T9Z7
A	272	HIS	-	expression tag	UNP Q8T9Z7
A	273	HIS	-	expression tag	UNP Q8T9Z7
A	274	HIS	-	expression tag	UNP Q8T9Z7
B	1	LEU	-	expression tag	UNP Q8T9Z7
B	246	LYS	-	expression tag	UNP Q8T9Z7
B	247	GLY	-	expression tag	UNP Q8T9Z7
B	248	GLU	-	expression tag	UNP Q8T9Z7
B	249	PHE	-	expression tag	UNP Q8T9Z7
B	250	GLU	-	expression tag	UNP Q8T9Z7
B	251	ALA	-	expression tag	UNP Q8T9Z7
B	252	TYR	-	expression tag	UNP Q8T9Z7
B	253	VAL	-	expression tag	UNP Q8T9Z7
B	254	GLU	-	expression tag	UNP Q8T9Z7
B	255	GLN	-	expression tag	UNP Q8T9Z7
B	256	LYS	-	expression tag	UNP Q8T9Z7
B	257	LEU	-	expression tag	UNP Q8T9Z7
B	258	ILE	-	expression tag	UNP Q8T9Z7
B	259	SER	-	expression tag	UNP Q8T9Z7
B	260	GLU	-	expression tag	UNP Q8T9Z7
B	261	GLU	-	expression tag	UNP Q8T9Z7
B	262	ASP	-	expression tag	UNP Q8T9Z7
B	263	LEU	-	expression tag	UNP Q8T9Z7
B	264	ASN	-	expression tag	UNP Q8T9Z7
B	265	SER	-	expression tag	UNP Q8T9Z7
B	266	ALA	-	expression tag	UNP Q8T9Z7
B	267	VAL	-	expression tag	UNP Q8T9Z7
B	268	ASP	-	expression tag	UNP Q8T9Z7
B	269	HIS	-	expression tag	UNP Q8T9Z7
B	270	HIS	-	expression tag	UNP Q8T9Z7
B	271	HIS	-	expression tag	UNP Q8T9Z7
B	272	HIS	-	expression tag	UNP Q8T9Z7
B	273	HIS	-	expression tag	UNP Q8T9Z7

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Chain	Residue	Modelled	Actual	Comment	Reference
B	274	HIS	-	expression tag	UNP Q8T9Z7
C	1	LEU	-	expression tag	UNP Q8T9Z7
C	246	LYS	-	expression tag	UNP Q8T9Z7
C	247	GLY	-	expression tag	UNP Q8T9Z7
C	248	GLU	-	expression tag	UNP Q8T9Z7
C	249	PHE	-	expression tag	UNP Q8T9Z7
C	250	GLU	-	expression tag	UNP Q8T9Z7
C	251	ALA	-	expression tag	UNP Q8T9Z7
C	252	TYR	-	expression tag	UNP Q8T9Z7
C	253	VAL	-	expression tag	UNP Q8T9Z7
C	254	GLU	-	expression tag	UNP Q8T9Z7
C	255	GLN	-	expression tag	UNP Q8T9Z7
C	256	LYS	-	expression tag	UNP Q8T9Z7
C	257	LEU	-	expression tag	UNP Q8T9Z7
C	258	ILE	-	expression tag	UNP Q8T9Z7
C	259	SER	-	expression tag	UNP Q8T9Z7
C	260	GLU	-	expression tag	UNP Q8T9Z7
C	261	GLU	-	expression tag	UNP Q8T9Z7
C	262	ASP	-	expression tag	UNP Q8T9Z7
C	263	LEU	-	expression tag	UNP Q8T9Z7
C	264	ASN	-	expression tag	UNP Q8T9Z7
C	265	SER	-	expression tag	UNP Q8T9Z7
C	266	ALA	-	expression tag	UNP Q8T9Z7
C	267	VAL	-	expression tag	UNP Q8T9Z7
C	268	ASP	-	expression tag	UNP Q8T9Z7
C	269	HIS	-	expression tag	UNP Q8T9Z7
C	270	HIS	-	expression tag	UNP Q8T9Z7
C	271	HIS	-	expression tag	UNP Q8T9Z7
C	272	HIS	-	expression tag	UNP Q8T9Z7
C	273	HIS	-	expression tag	UNP Q8T9Z7
C	274	HIS	-	expression tag	UNP Q8T9Z7
D	1	LEU	-	expression tag	UNP Q8T9Z7
D	246	LYS	-	expression tag	UNP Q8T9Z7
D	247	GLY	-	expression tag	UNP Q8T9Z7
D	248	GLU	-	expression tag	UNP Q8T9Z7
D	249	PHE	-	expression tag	UNP Q8T9Z7
D	250	GLU	-	expression tag	UNP Q8T9Z7
D	251	ALA	-	expression tag	UNP Q8T9Z7
D	252	TYR	-	expression tag	UNP Q8T9Z7
D	253	VAL	-	expression tag	UNP Q8T9Z7
D	254	GLU	-	expression tag	UNP Q8T9Z7
D	255	GLN	-	expression tag	UNP Q8T9Z7

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Chain	Residue	Modelled	Actual	Comment	Reference
D	256	LYS	-	expression tag	UNP Q8T9Z7
D	257	LEU	-	expression tag	UNP Q8T9Z7
D	258	ILE	-	expression tag	UNP Q8T9Z7
D	259	SER	-	expression tag	UNP Q8T9Z7
D	260	GLU	-	expression tag	UNP Q8T9Z7
D	261	GLU	-	expression tag	UNP Q8T9Z7
D	262	ASP	-	expression tag	UNP Q8T9Z7
D	263	LEU	-	expression tag	UNP Q8T9Z7
D	264	ASN	-	expression tag	UNP Q8T9Z7
D	265	SER	-	expression tag	UNP Q8T9Z7
D	266	ALA	-	expression tag	UNP Q8T9Z7
D	267	VAL	-	expression tag	UNP Q8T9Z7
D	268	ASP	-	expression tag	UNP Q8T9Z7
D	269	HIS	-	expression tag	UNP Q8T9Z7
D	270	HIS	-	expression tag	UNP Q8T9Z7
D	271	HIS	-	expression tag	UNP Q8T9Z7
D	272	HIS	-	expression tag	UNP Q8T9Z7
D	273	HIS	-	expression tag	UNP Q8T9Z7
D	274	HIS	-	expression tag	UNP Q8T9Z7
E	1	LEU	-	expression tag	UNP Q8T9Z7
E	246	LYS	-	expression tag	UNP Q8T9Z7
E	247	GLY	-	expression tag	UNP Q8T9Z7
E	248	GLU	-	expression tag	UNP Q8T9Z7
E	249	PHE	-	expression tag	UNP Q8T9Z7
E	250	GLU	-	expression tag	UNP Q8T9Z7
E	251	ALA	-	expression tag	UNP Q8T9Z7
E	252	TYR	-	expression tag	UNP Q8T9Z7
E	253	VAL	-	expression tag	UNP Q8T9Z7
E	254	GLU	-	expression tag	UNP Q8T9Z7
E	255	GLN	-	expression tag	UNP Q8T9Z7
E	256	LYS	-	expression tag	UNP Q8T9Z7
E	257	LEU	-	expression tag	UNP Q8T9Z7
E	258	ILE	-	expression tag	UNP Q8T9Z7
E	259	SER	-	expression tag	UNP Q8T9Z7
E	260	GLU	-	expression tag	UNP Q8T9Z7
E	261	GLU	-	expression tag	UNP Q8T9Z7
E	262	ASP	-	expression tag	UNP Q8T9Z7
E	263	LEU	-	expression tag	UNP Q8T9Z7
E	264	ASN	-	expression tag	UNP Q8T9Z7
E	265	SER	-	expression tag	UNP Q8T9Z7
E	266	ALA	-	expression tag	UNP Q8T9Z7
E	267	VAL	-	expression tag	UNP Q8T9Z7

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Chain	Residue	Modelled	Actual	Comment	Reference
E	268	ASP	-	expression tag	UNP Q8T9Z7
E	269	HIS	-	expression tag	UNP Q8T9Z7
E	270	HIS	-	expression tag	UNP Q8T9Z7
E	271	HIS	-	expression tag	UNP Q8T9Z7
E	272	HIS	-	expression tag	UNP Q8T9Z7
E	273	HIS	-	expression tag	UNP Q8T9Z7
E	274	HIS	-	expression tag	UNP Q8T9Z7
F	1	LEU	-	expression tag	UNP Q8T9Z7
F	246	LYS	-	expression tag	UNP Q8T9Z7
F	247	GLY	-	expression tag	UNP Q8T9Z7
F	248	GLU	-	expression tag	UNP Q8T9Z7
F	249	PHE	-	expression tag	UNP Q8T9Z7
F	250	GLU	-	expression tag	UNP Q8T9Z7
F	251	ALA	-	expression tag	UNP Q8T9Z7
F	252	TYR	-	expression tag	UNP Q8T9Z7
F	253	VAL	-	expression tag	UNP Q8T9Z7
F	254	GLU	-	expression tag	UNP Q8T9Z7
F	255	GLN	-	expression tag	UNP Q8T9Z7
F	256	LYS	-	expression tag	UNP Q8T9Z7
F	257	LEU	-	expression tag	UNP Q8T9Z7
F	258	ILE	-	expression tag	UNP Q8T9Z7
F	259	SER	-	expression tag	UNP Q8T9Z7
F	260	GLU	-	expression tag	UNP Q8T9Z7
F	261	GLU	-	expression tag	UNP Q8T9Z7
F	262	ASP	-	expression tag	UNP Q8T9Z7
F	263	LEU	-	expression tag	UNP Q8T9Z7
F	264	ASN	-	expression tag	UNP Q8T9Z7
F	265	SER	-	expression tag	UNP Q8T9Z7
F	266	ALA	-	expression tag	UNP Q8T9Z7
F	267	VAL	-	expression tag	UNP Q8T9Z7
F	268	ASP	-	expression tag	UNP Q8T9Z7
F	269	HIS	-	expression tag	UNP Q8T9Z7
F	270	HIS	-	expression tag	UNP Q8T9Z7
F	271	HIS	-	expression tag	UNP Q8T9Z7
F	272	HIS	-	expression tag	UNP Q8T9Z7
F	273	HIS	-	expression tag	UNP Q8T9Z7
F	274	HIS	-	expression tag	UNP Q8T9Z7

- Molecule 2 is POTASSIUM ION (CCD ID: K) (formula: K).

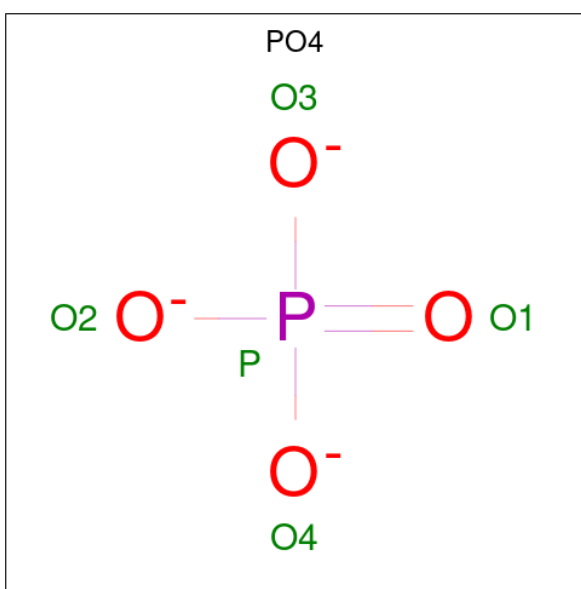
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Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
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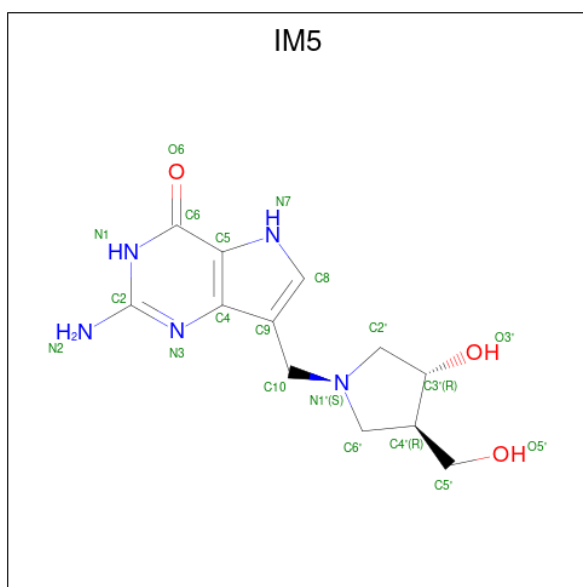
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	1	Total K 1 1	0	0
2	C	1	Total K 1 1	0	0
2	E	1	Total K 1 1	0	0

- Molecule 3 is PHOSPHATE ION (CCD ID: PO4) (formula: O₄P).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	1	Total O P 5 4 1	0	0
3	B	1	Total O P 5 4 1	0	0
3	C	1	Total O P 5 4 1	0	0
3	D	1	Total O P 5 4 1	0	0
3	E	1	Total O P 5 4 1	0	0
3	F	1	Total O P 5 4 1	0	0

- Molecule 4 is 2-amino-7-[[[(3R,4R)-3-hydroxy-4-(hydroxymethyl)pyrrolidin-1-yl]methyl]-3,5-dihydro-4H-pyrrolo[3,2-d]pyrimidin-4-one (CCD ID: IM5) (formula: C₁₂H₁₇N₅O₃).



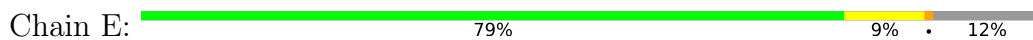
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
4	A	1	Total	C	N	O	0	0
			20	12	5	3		
4	B	1	Total	C	N	O	0	0
			20	12	5	3		
4	C	1	Total	C	N	O	0	0
			20	12	5	3		
4	D	1	Total	C	N	O	0	0
			20	12	5	3		
4	E	1	Total	C	N	O	0	0
			20	12	5	3		
4	F	1	Total	C	N	O	0	0
			20	12	5	3		

- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	38	Total	O	0	0
			38	38		
5	B	48	Total	O	0	0
			48	48		
5	C	47	Total	O	0	0
			47	47		
5	D	59	Total	O	0	0
			59	59		
5	E	68	Total	O	0	0
			68	68		
5	F	52	Total	O	0	0
			52	52		

VAL
GLU
GLN
LYS
LEU
ILE
SER
GLU
GLU
ASP
LEU
LEU
ASN
SER
ALA
ASP
HIS
HIS
HIS
HIS
HIS

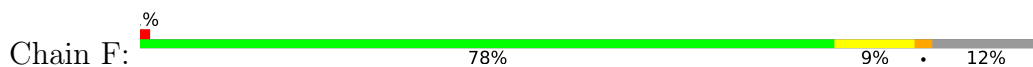
● Molecule 1: Purine nucleoside phosphorylase



MET LEU ASP N3 L4 L5 I16 V22 R27 V33 E46 Y47 K48 Q57 K58 V62 S63 E77 N81 G90 R102 L121 M163 K164 S168 E182 D216 V222 P223 K231 A238 T242 A245 LYS GLU PHE GLU ALA

TYR
VAL
GLU
GLN
LYS
LEU
ILE
SER
GLU
GLU
ASP
LEU
ASN
SER
ALA
VAL
ASP
HIS
HIS
HIS
HIS
HIS

● Molecule 1: Purine nucleoside phosphorylase



MET LEU ASP N3 L4 L5 E13 Q14 I15 V22 L41 E46 Q57 S63 H64 G65 A89 I100 V112 V117 L121 F132 D133 S157 M163 S168 Y173 E182 M183 V205 C208 P209 V222 P223 M229 A241 A245

LYS
GLY
GLU
PHE
GLU
ALA
TYR
VAL
GLU
GLN
LYS
LEU
ILE
SER
GLU
GLU
ASP
LEU
ASN
SER
ALA
VAL
ASP
HIS
HIS
HIS
HIS
HIS

4 Data and refinement statistics

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, α , β , γ	61.20Å 77.37Å 92.20Å 67.71° 73.62° 86.03°	Depositor
Resolution (Å)	20.00 – 2.00 20.00 – 2.00	Depositor EDS
% Data completeness (in resolution range)	93.8 (20.00-2.00) 94.3 (20.00-2.00)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.46 (at 1.99Å)	Xtrriage
Refinement program	REFMAC 5.5.0109	Depositor
R, R_{free}	0.198 , 0.235 (Not available) , 0.244	Depositor DCC
R_{free} test set	4781 reflections (4.99%)	wwPDB-VP
Wilson B-factor (Å ²)	27.8	Xtrriage
Anisotropy	0.025	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 29.2	EDS
L-test for twinning ²	$\langle L \rangle = 0.51$, $\langle L^2 \rangle = 0.34$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	11631	wwPDB-VP
Average B, all atoms (Å ²)	29.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 11.36% 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 [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: PO4, IM5, K

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	0.61	0/1893	0.83	0/2561
1	B	0.63	0/1893	0.85	1/2561 (0.0%)
1	C	0.63	0/1893	0.85	2/2561 (0.1%)
1	D	0.64	0/1893	0.87	2/2561 (0.1%)
1	E	0.65	0/1893	0.87	0/2561
1	F	0.64	0/1893	0.88	4/2561 (0.2%)
All	All	0.63	0/11358	0.86	9/15366 (0.1%)

There are no bond length outliers.

The worst 5 of 9 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	F	117	VAL	CB-CA-C	-7.50	102.28	111.88
1	F	222	VAL	CA-C-N	6.40	125.90	119.24
1	F	222	VAL	C-N-CA	6.40	125.90	119.24
1	F	117	VAL	N-CA-CB	6.14	117.33	110.51
1	C	166	ILE	CA-C-N	-5.28	114.48	119.76

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts [i](#)

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

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	1861	0	1882	18	0
1	B	1861	0	1882	24	0
1	C	1861	0	1882	16	0
1	D	1861	0	1882	14	0
1	E	1861	0	1882	17	0
1	F	1861	0	1882	18	0
2	A	1	0	0	0	0
2	C	1	0	0	0	0
2	E	1	0	0	0	0
3	A	5	0	0	1	0
3	B	5	0	0	0	0
3	C	5	0	0	0	0
3	D	5	0	0	0	0
3	E	5	0	0	2	0
3	F	5	0	0	0	0
4	A	20	0	17	0	0
4	B	20	0	17	1	0
4	C	20	0	17	0	0
4	D	20	0	17	0	0
4	E	20	0	17	0	0
4	F	20	0	17	0	0
5	A	38	0	0	2	0
5	B	48	0	0	0	0
5	C	47	0	0	2	0
5	D	59	0	0	1	0
5	E	68	0	0	2	0
5	F	52	0	0	0	0
All	All	11631	0	11394	100	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.

The worst 5 of 100 close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:163:ASN:HD22	1:A:164:LYS:H	1.19	0.88
1:D:163:ASN:HD22	1:D:164:LYS:H	1.24	0.85
1:A:46:GLU:HB3	1:B:46:GLU:HB3	1.62	0.79
1:C:46:GLU:HB3	1:D:46:GLU:HB3	1.64	0.77
1:A:109:ASN:HD22	1:A:109:ASN:H	1.35	0.74

There are no symmetry-related clashes.

5.3 Torsion angles [i](#)

5.3.1 Protein backbone [i](#)

There are no protein backbone outliers to report in this entry.

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	206/235 (88%)	199 (97%)	7 (3%)	32	33
1	B	206/235 (88%)	194 (94%)	12 (6%)	18	15
1	C	206/235 (88%)	202 (98%)	4 (2%)	50	56
1	D	206/235 (88%)	201 (98%)	5 (2%)	43	47
1	E	206/235 (88%)	200 (97%)	6 (3%)	37	40
1	F	206/235 (88%)	197 (96%)	9 (4%)	25	24
All	All	1236/1410 (88%)	1193 (96%)	43 (4%)	32	32

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

Mol	Chain	Res	Type
1	E	33	VAL
1	F	15	ILE
1	E	163	ASN
1	E	182	GLU
1	F	57	GLN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 24 such sidechains are listed below:

Mol	Chain	Res	Type
1	C	219	ASN
1	D	163	ASN
1	D	57	GLN
1	D	219	ASN
1	B	53	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 oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 15 ligands modelled in this entry, 3 are monoatomic - leaving 12 for Mogul analysis.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
3	PO4	F	502	-	4,4,4	0.81	0	6,6,6	0.41	0
4	IM5	A	501	-	22,22,22	2.19	3 (13%)	25,32,32	2.41	8 (32%)
3	PO4	B	502	-	4,4,4	0.87	0	6,6,6	0.50	0
4	IM5	C	501	-	22,22,22	2.16	3 (13%)	25,32,32	2.37	9 (36%)
4	IM5	D	501	-	22,22,22	2.23	3 (13%)	25,32,32	2.57	8 (32%)
4	IM5	F	501	-	22,22,22	2.20	3 (13%)	25,32,32	2.30	9 (36%)
4	IM5	B	501	-	22,22,22	2.17	2 (9%)	25,32,32	2.41	9 (36%)
3	PO4	C	502	-	4,4,4	0.87	0	6,6,6	0.54	0
3	PO4	E	502	-	4,4,4	0.81	0	6,6,6	0.72	0
4	IM5	E	501	-	22,22,22	2.20	3 (13%)	25,32,32	2.63	9 (36%)
3	PO4	D	502	-	4,4,4	0.85	0	6,6,6	0.77	0
3	PO4	A	502	-	4,4,4	0.86	0	6,6,6	0.56	0

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns.

'-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
4	IM5	A	501	-	-	2/6/18/18	0/3/3/3
4	IM5	C	501	-	-	3/6/18/18	0/3/3/3
4	IM5	D	501	-	-	1/6/18/18	0/3/3/3
4	IM5	F	501	-	-	1/6/18/18	0/3/3/3
4	IM5	B	501	-	-	1/6/18/18	0/3/3/3
4	IM5	E	501	-	-	1/6/18/18	0/3/3/3

The worst 5 of 17 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	D	501	IM5	C5-C4	9.28	1.47	1.38
4	F	501	IM5	C5-C4	9.20	1.47	1.38
4	B	501	IM5	C5-C4	9.13	1.47	1.38
4	A	501	IM5	C5-C4	9.08	1.47	1.38
4	E	501	IM5	C5-C4	8.97	1.47	1.38

The worst 5 of 52 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	E	501	IM5	C4-C5-C6	-7.09	115.18	121.41
4	D	501	IM5	C9-C10-N1'	7.05	123.25	113.38
4	B	501	IM5	C4-C5-C6	-6.40	115.78	121.41
4	E	501	IM5	C9-C10-N1'	6.40	122.34	113.38
4	D	501	IM5	C4-C5-C6	-6.17	115.98	121.41

There are no chirality outliers.

5 of 9 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	A	501	IM5	C9-C10-N1'-C6'
4	B	501	IM5	C9-C10-N1'-C6'
4	C	501	IM5	C9-C10-N1'-C6'
4	C	501	IM5	C3'-C4'-C5'-O5'
4	C	501	IM5	C6'-C4'-C5'-O5'

There are no ring outliers.

3 monomers are involved in 4 short contacts:

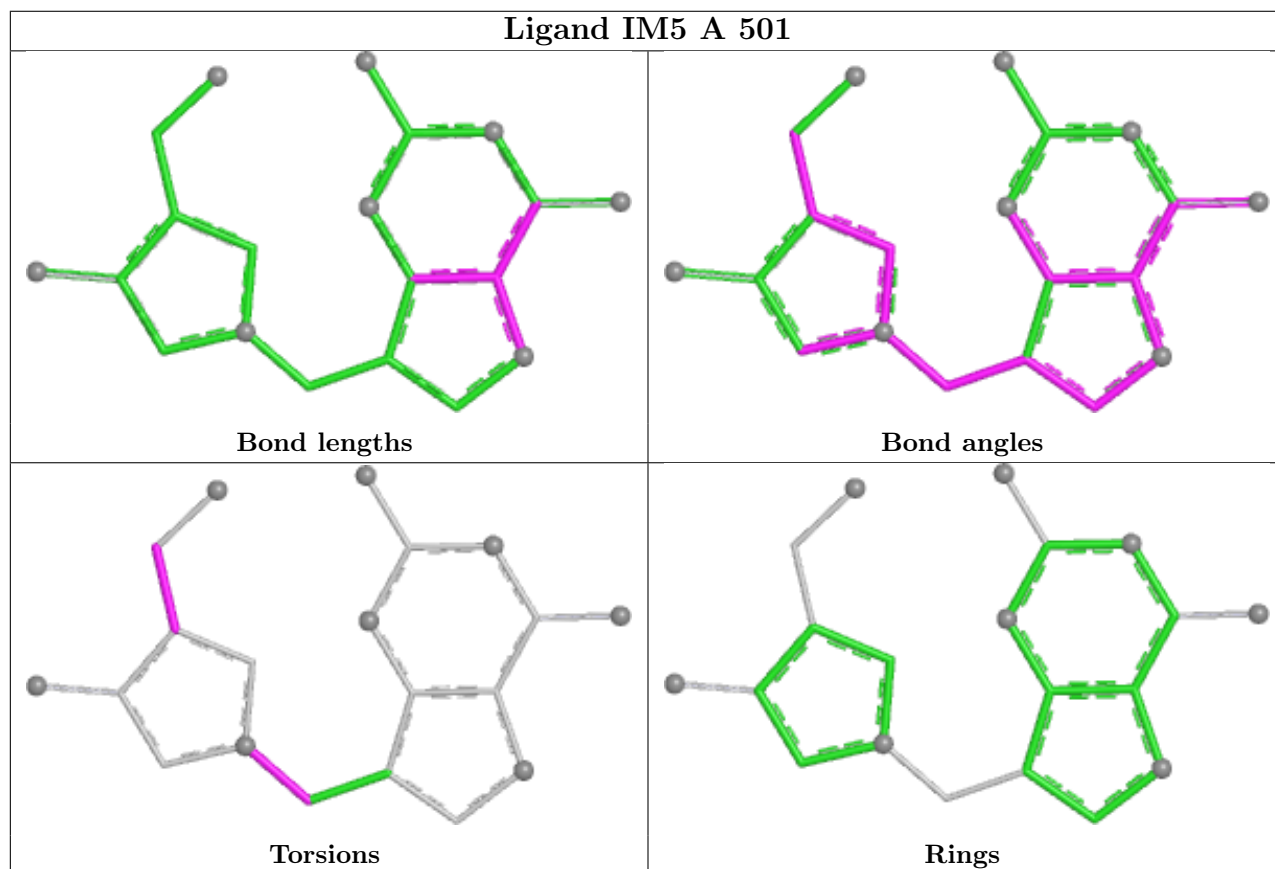
Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	B	501	IM5	1	0

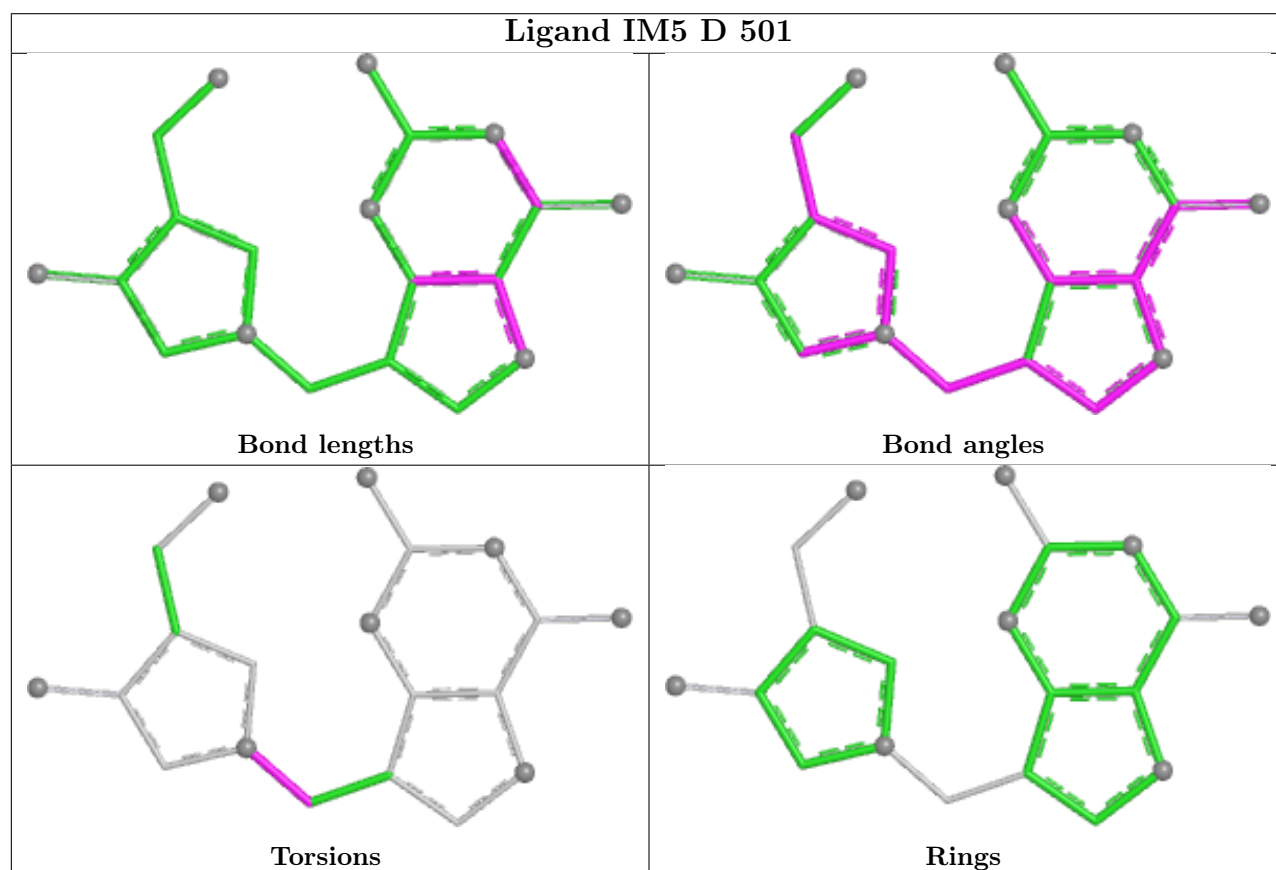
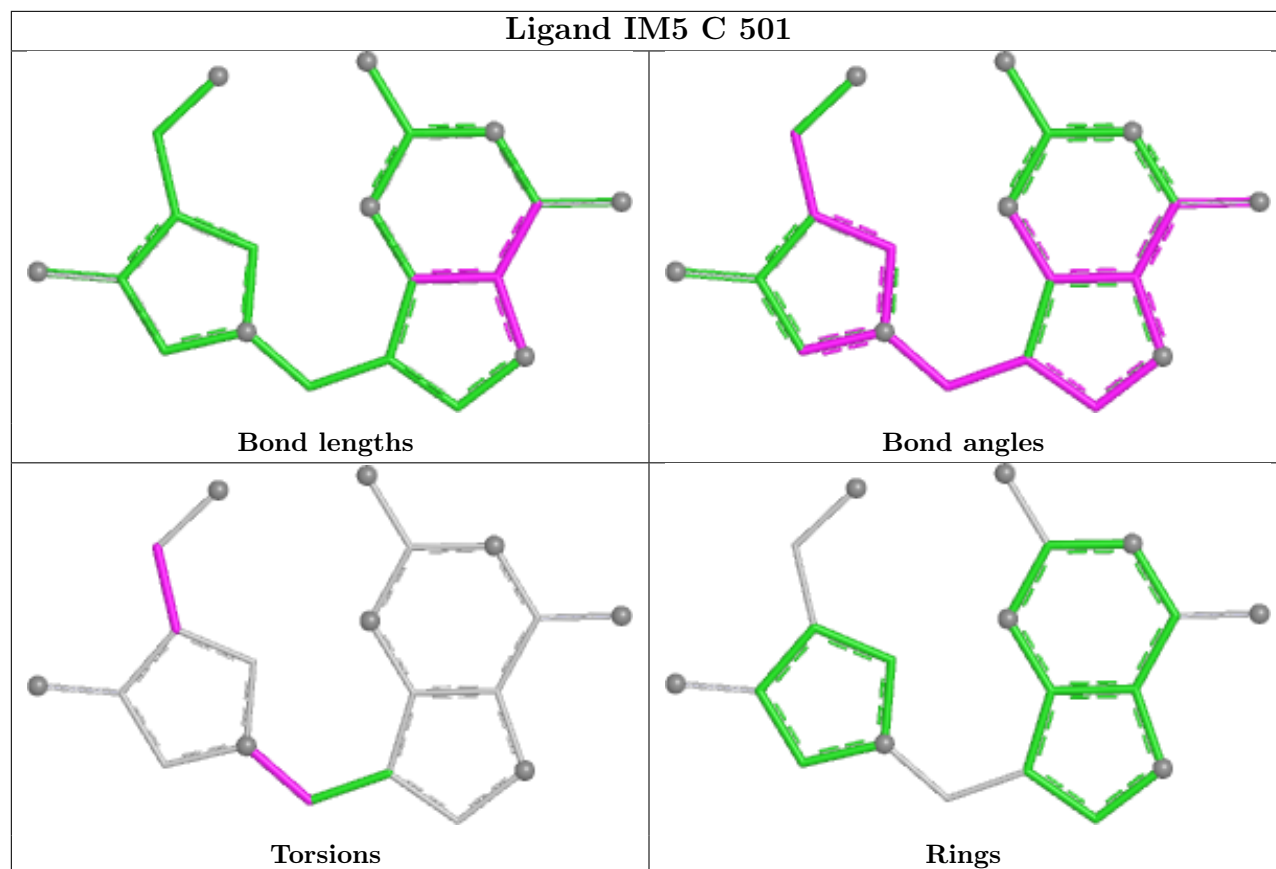
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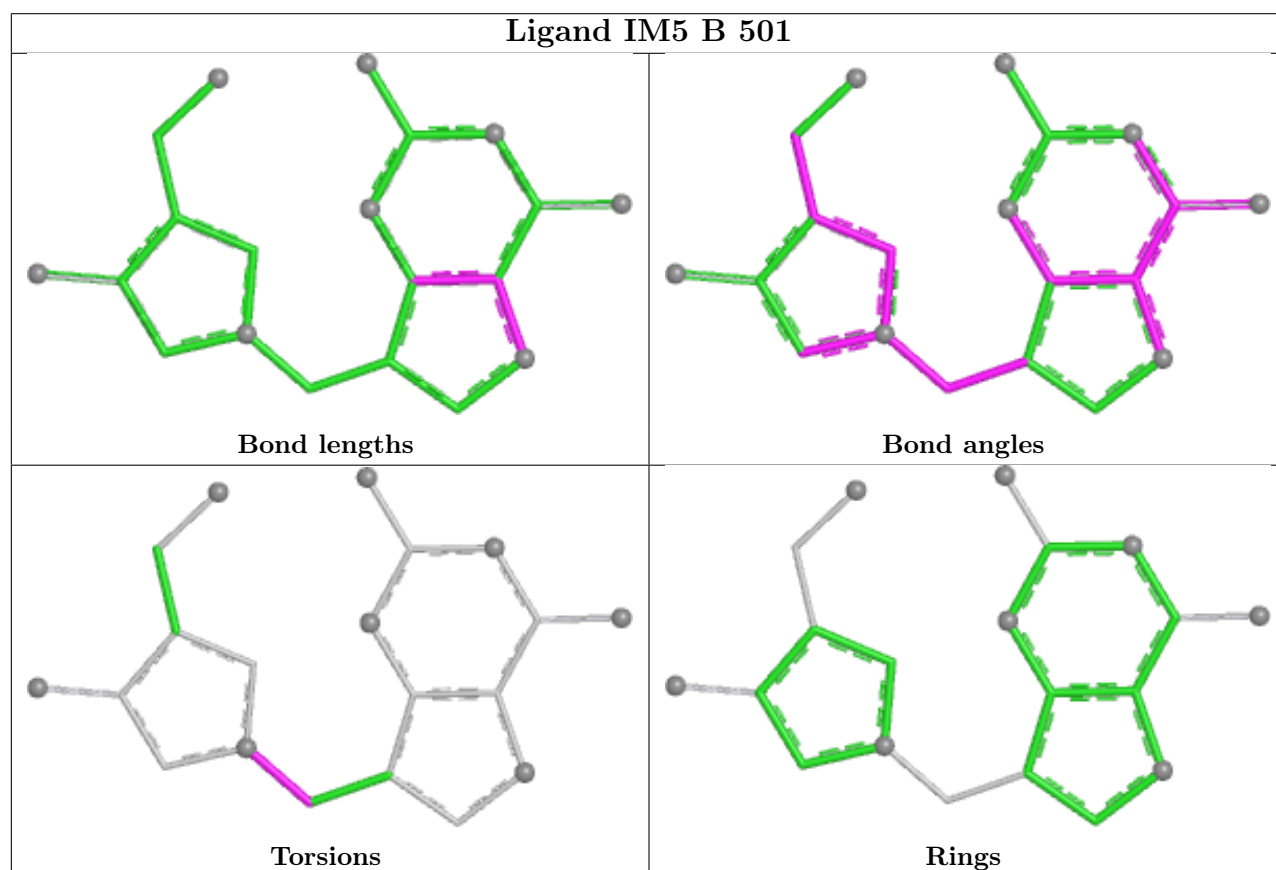
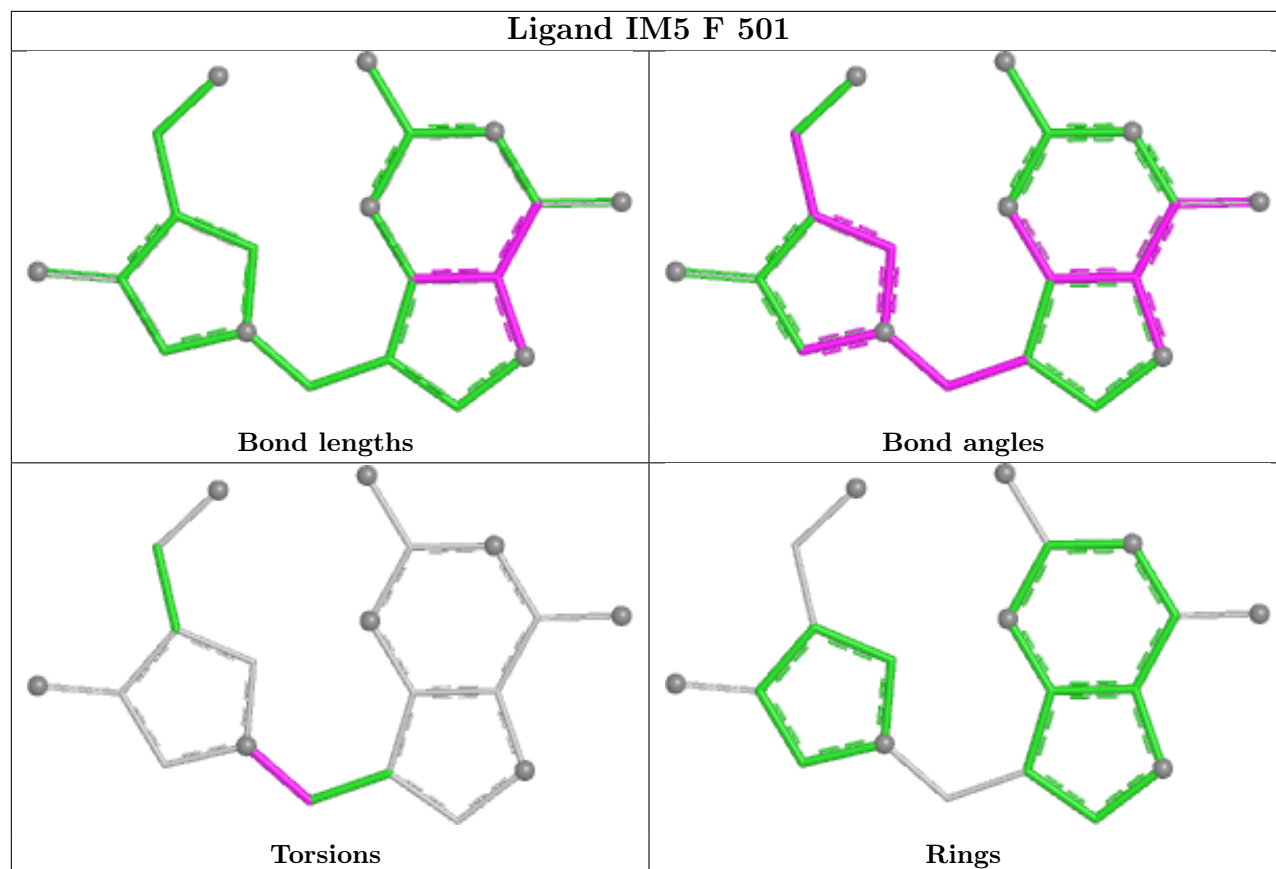
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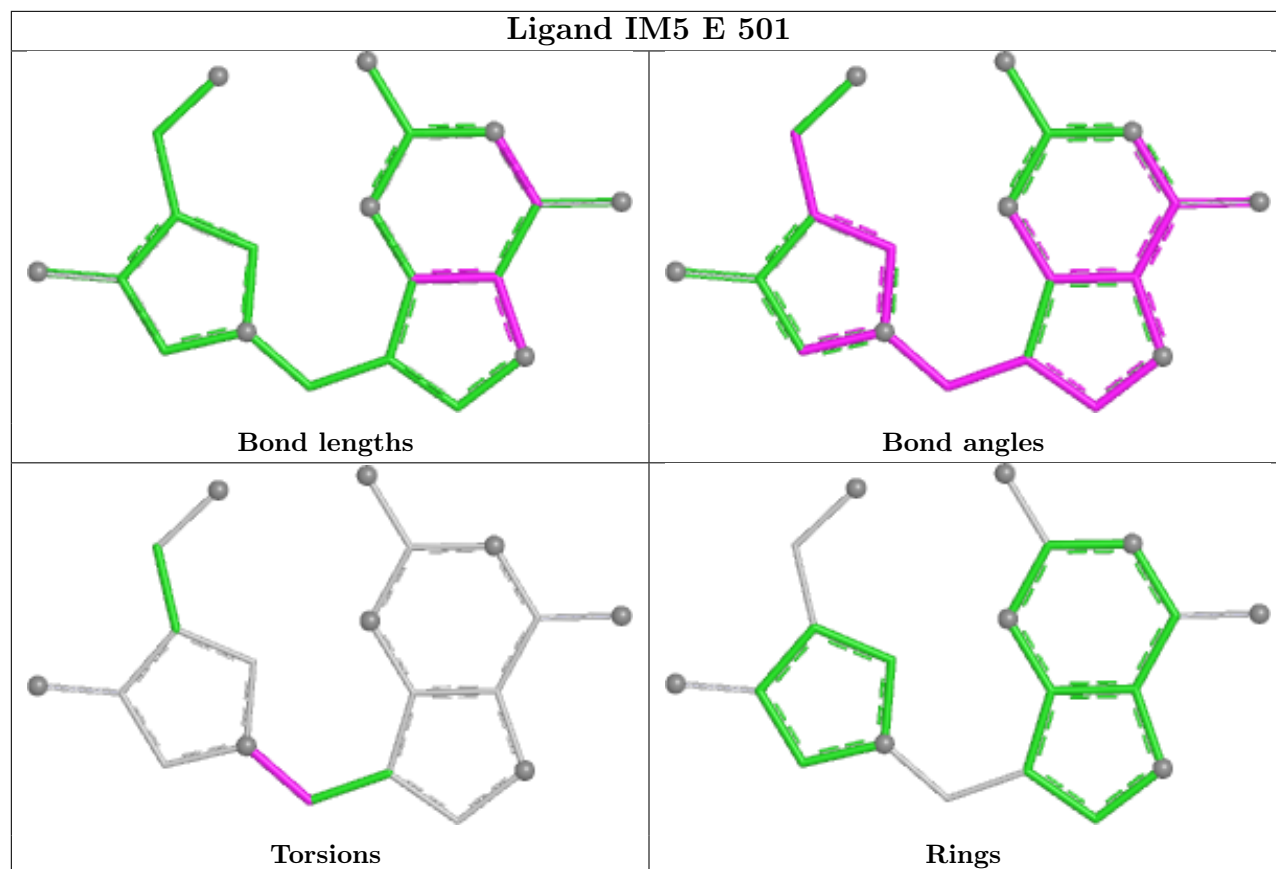
Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	E	502	PO4	2	0
3	A	502	PO4	1	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.









5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data [i](#)

6.1 Protein, DNA and RNA chains [i](#)

In the following table, the column labelled ‘#RSRZ> 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 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	243/275 (88%)	0.10	3 (1%) 76 76	20, 31, 44, 50	0
1	B	243/275 (88%)	0.18	2 (0%) 82 82	19, 32, 46, 53	0
1	C	243/275 (88%)	-0.00	2 (0%) 82 82	20, 29, 44, 52	0
1	D	243/275 (88%)	-0.11	5 (2%) 63 63	18, 26, 38, 46	0
1	E	243/275 (88%)	-0.11	1 (0%) 88 88	18, 25, 35, 44	0
1	F	243/275 (88%)	-0.01	4 (1%) 70 70	19, 28, 42, 47	0
All	All	1458/1650 (88%)	0.01	17 (1%) 76 76	18, 28, 43, 53	0

The worst 5 of 17 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	245	ALA	3.9
1	F	245	ALA	3.9
1	D	13	GLU	3.3
1	B	132	PHE	3.1
1	C	132	PHE	3.0

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 oligosaccharides in this entry.

6.4 Ligands

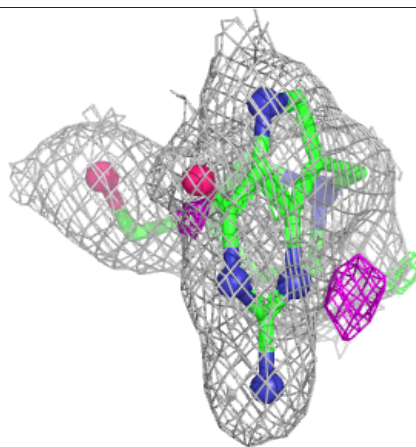
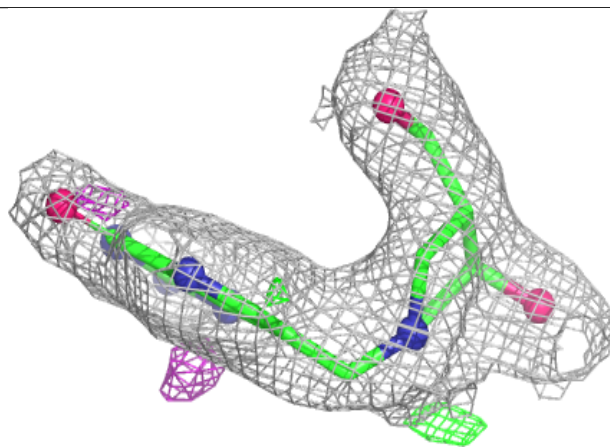
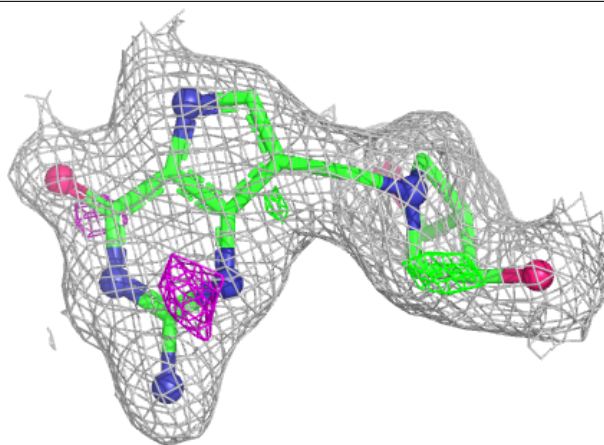
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists 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	IM5	C	501	20/20	0.90	0.09	26,28,31,32	0
4	IM5	D	501	20/20	0.90	0.09	25,28,31,32	0
4	IM5	B	501	20/20	0.91	0.08	29,32,35,37	0
4	IM5	A	501	20/20	0.92	0.08	27,31,32,32	0
4	IM5	F	501	20/20	0.92	0.08	25,28,29,30	0
4	IM5	E	501	20/20	0.93	0.08	20,22,25,28	0
3	PO4	A	502	5/5	0.95	0.10	33,34,35,36	0
3	PO4	D	502	5/5	0.96	0.08	27,28,29,29	0
3	PO4	F	502	5/5	0.96	0.07	28,29,31,32	0
3	PO4	B	502	5/5	0.97	0.07	37,38,39,39	0
3	PO4	E	502	5/5	0.97	0.06	22,22,23,24	0
3	PO4	C	502	5/5	0.97	0.08	30,31,33,33	0
2	K	A	275	1/1	0.99	0.06	29,29,29,29	0
2	K	C	275	1/1	0.99	0.06	28,28,28,28	0
2	K	E	275	1/1	0.99	0.10	24,24,24,24	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.

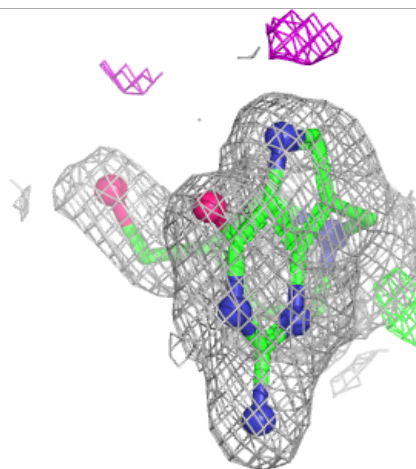
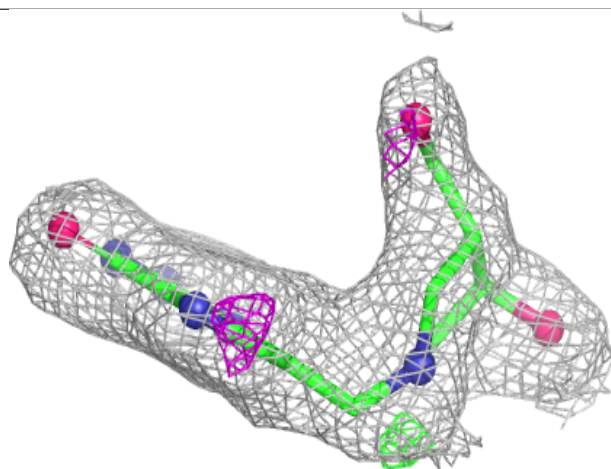
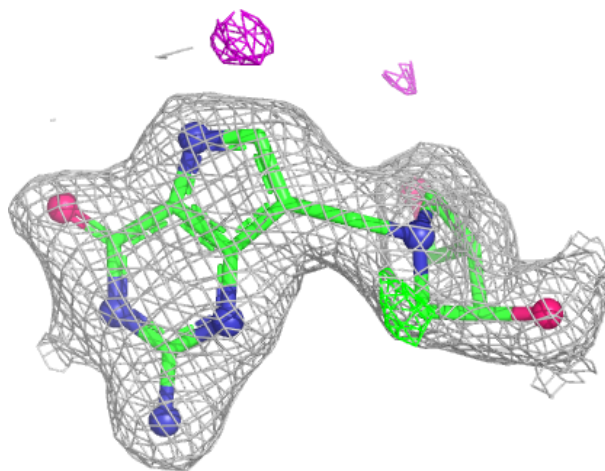
Electron density around IM5 C 501:

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



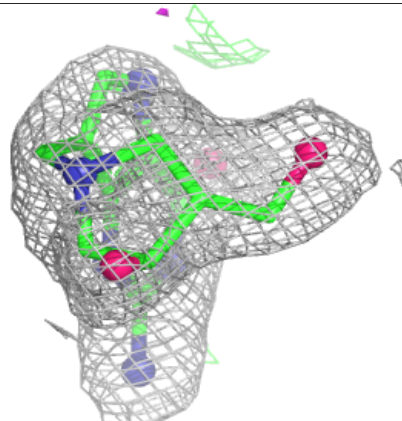
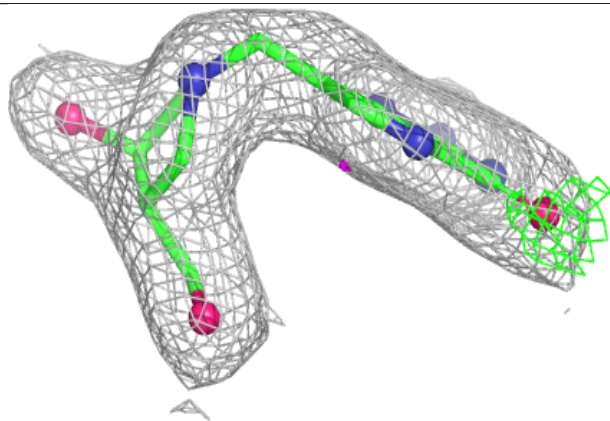
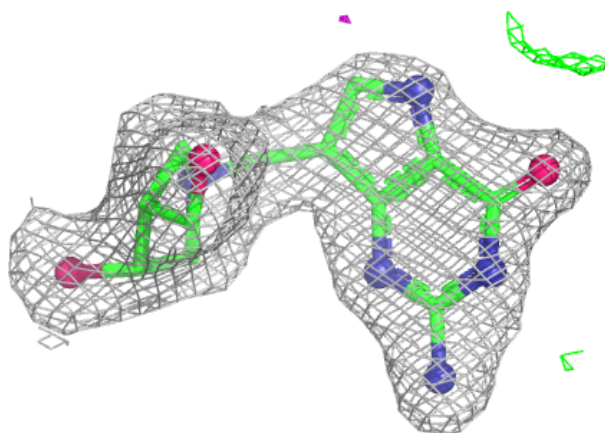
Electron density around IM5 D 501:

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



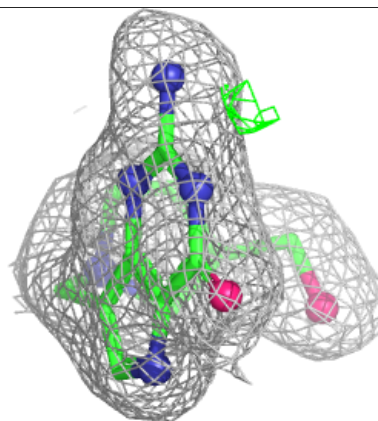
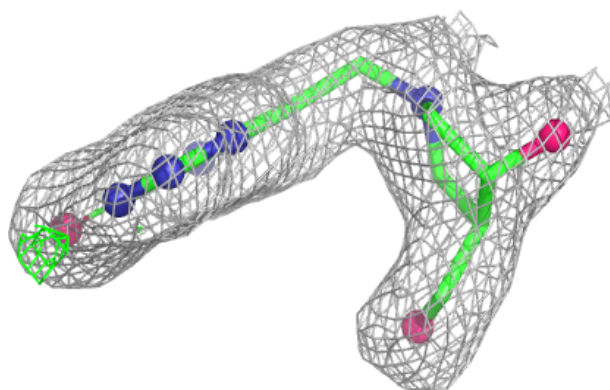
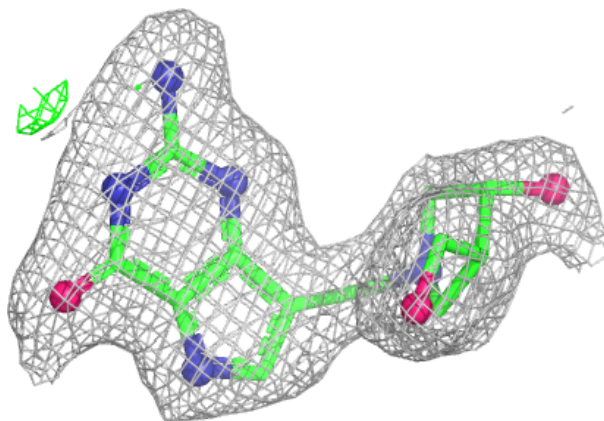
Electron density around IM5 B 501:

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and green (positive)

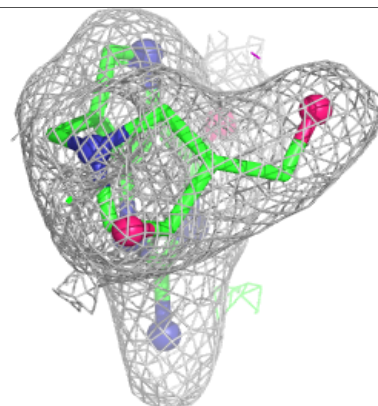
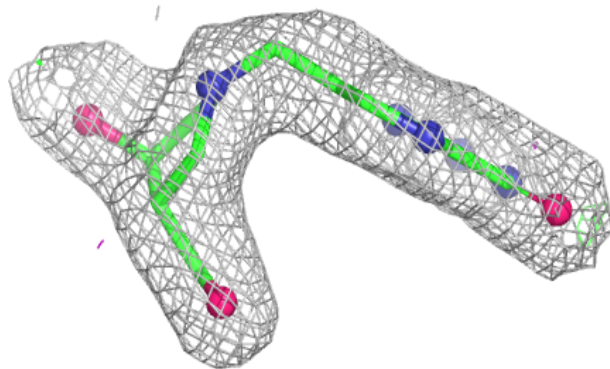
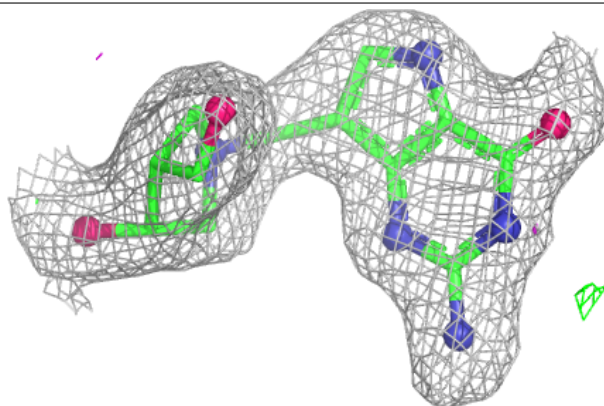


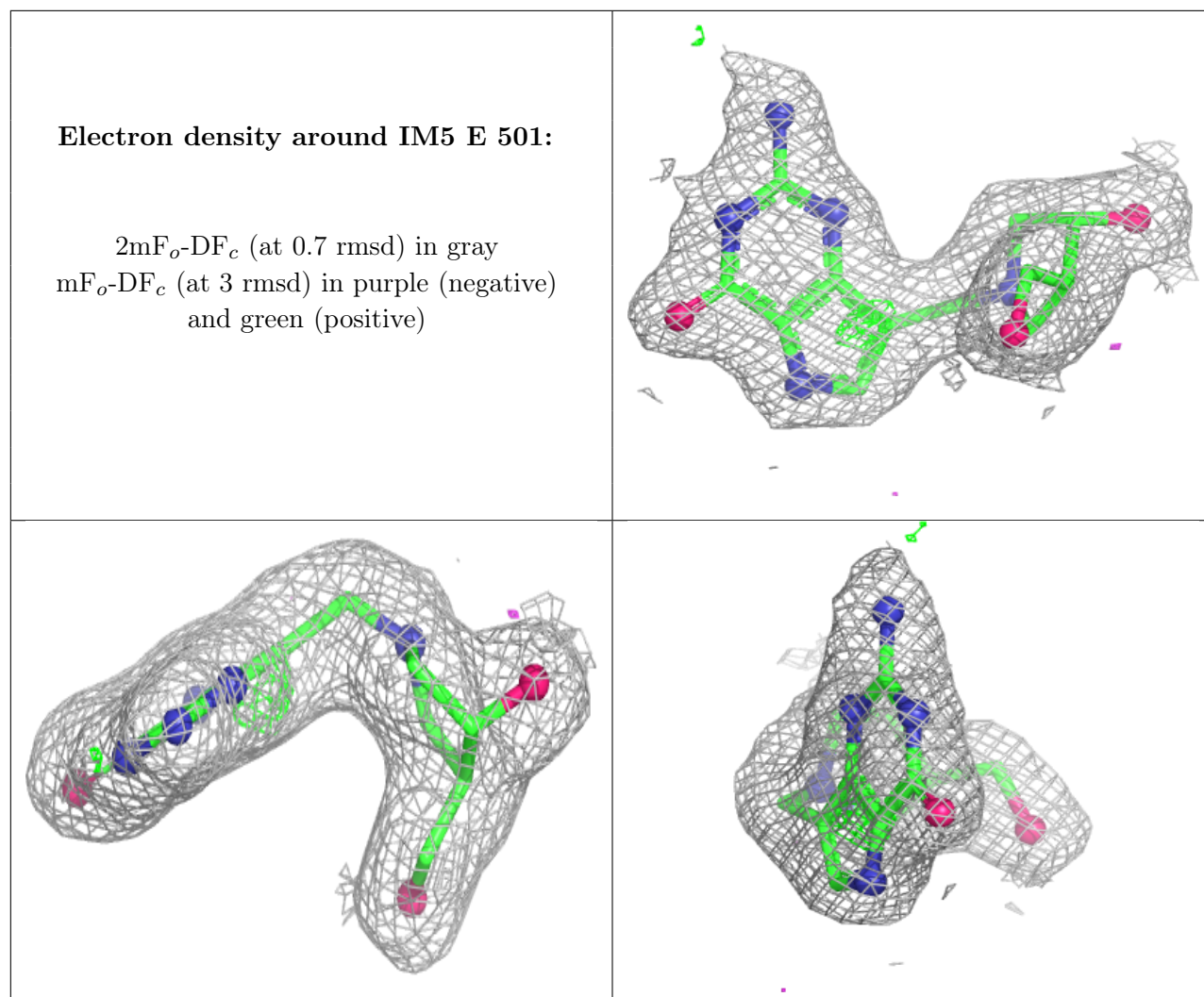
Electron density around IM5 A 501:

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

**Electron density around IM5 F 501:**

$2mF_o-DF_c$ (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.