W O R L D W I D E
wwPDB
P R O T E I N   D A T A   B A N K

wwPDB X-ray Structure Validation Summary Report (i)

Feb 15, 2024 – 10:20 AM EST

PDB ID	:	3PHB
Title	:	Crystal Structure of human purine nucleoside phosphorylase in complex with DADMe-ImmG
Authors	:	Ho, M.; Cassera, M.B.; Murkin, A.S.; Almo, S.C.; Schramm, V.L.
Deposited on	:	2010-11-03
Resolution	:	2.30 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	:	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 2.30 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.
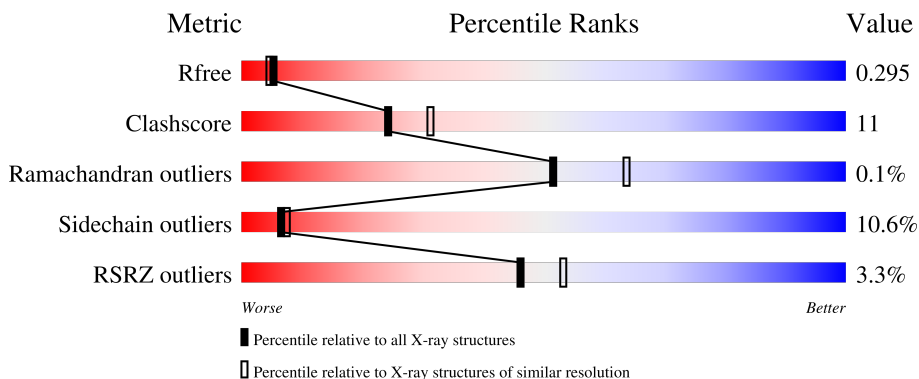
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	5042 (2.30-2.30)
Clashscore	141614	5643 (2.30-2.30)
Ramachandran outliers	138981	5575 (2.30-2.30)
Sidechain outliers	138945	5575 (2.30-2.30)
RSRZ outliers	127900	4938 (2.30-2.30)

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	E	324	
1	Q	324	
1	S	324	
1	T	324	
1	U	324	

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Mol	Chain	Length	Quality of chain
1	Y	324	2% ▮ 67% 19% · 12%

2   Entry composition ⓘ

There are 4 unique types of molecules in this entry. The entry contains 13732 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
1	E	288	Total	C	N	O	S	0	0	0
			2252	1433	393	410	16			
1	Q	287	Total	C	N	O	S	0	1	0
			2256	1434	396	410	16			
1	S	286	Total	C	N	O	S	0	0	0
			2238	1424	391	407	16			
1	T	287	Total	C	N	O	S	0	0	0
			2245	1428	392	409	16			
1	U	285	Total	C	N	O	S	0	1	0
			2241	1424	395	407	15			
1	Y	285	Total	C	N	O	S	0	0	0
			2230	1418	390	406	16			

There are 216 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
E	-34	MET	-	expression tag	UNP P00491
E	-33	ARG	-	expression tag	UNP P00491
E	-32	GLY	-	expression tag	UNP P00491
E	-31	SER	-	expression tag	UNP P00491
E	-30	HIS	-	expression tag	UNP P00491
E	-29	HIS	-	expression tag	UNP P00491
E	-28	HIS	-	expression tag	UNP P00491
E	-27	HIS	-	expression tag	UNP P00491
E	-26	HIS	-	expression tag	UNP P00491
E	-25	HIS	-	expression tag	UNP P00491
E	-24	GLY	-	expression tag	UNP P00491
E	-23	MET	-	expression tag	UNP P00491
E	-22	ALA	-	expression tag	UNP P00491
E	-21	SER	-	expression tag	UNP P00491
E	-20	MET	-	expression tag	UNP P00491
E	-19	THR	-	expression tag	UNP P00491
E	-18	GLY	-	expression tag	UNP P00491

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Chain	Residue	Modelled	Actual	Comment	Reference
E	-17	GLY	-	expression tag	UNP P00491
E	-16	GLN	-	expression tag	UNP P00491
E	-15	GLN	-	expression tag	UNP P00491
E	-14	MET	-	expression tag	UNP P00491
E	-13	GLY	-	expression tag	UNP P00491
E	-12	ARG	-	expression tag	UNP P00491
E	-11	ASP	-	expression tag	UNP P00491
E	-10	LEU	-	expression tag	UNP P00491
E	-9	TYR	-	expression tag	UNP P00491
E	-8	ASP	-	expression tag	UNP P00491
E	-7	ASP	-	expression tag	UNP P00491
E	-6	ASP	-	expression tag	UNP P00491
E	-5	ASP	-	expression tag	UNP P00491
E	-4	LYS	-	expression tag	UNP P00491
E	-3	ASP	-	expression tag	UNP P00491
E	-2	PRO	-	expression tag	UNP P00491
E	-1	THR	-	expression tag	UNP P00491
E	0	LEU	-	expression tag	UNP P00491
E	51	SER	GLY	conflict	UNP P00491
Q	-34	MET	-	expression tag	UNP P00491
Q	-33	ARG	-	expression tag	UNP P00491
Q	-32	GLY	-	expression tag	UNP P00491
Q	-31	SER	-	expression tag	UNP P00491
Q	-30	HIS	-	expression tag	UNP P00491
Q	-29	HIS	-	expression tag	UNP P00491
Q	-28	HIS	-	expression tag	UNP P00491
Q	-27	HIS	-	expression tag	UNP P00491
Q	-26	HIS	-	expression tag	UNP P00491
Q	-25	HIS	-	expression tag	UNP P00491
Q	-24	GLY	-	expression tag	UNP P00491
Q	-23	MET	-	expression tag	UNP P00491
Q	-22	ALA	-	expression tag	UNP P00491
Q	-21	SER	-	expression tag	UNP P00491
Q	-20	MET	-	expression tag	UNP P00491
Q	-19	THR	-	expression tag	UNP P00491
Q	-18	GLY	-	expression tag	UNP P00491
Q	-17	GLY	-	expression tag	UNP P00491
Q	-16	GLN	-	expression tag	UNP P00491
Q	-15	GLN	-	expression tag	UNP P00491
Q	-14	MET	-	expression tag	UNP P00491
Q	-13	GLY	-	expression tag	UNP P00491
Q	-12	ARG	-	expression tag	UNP P00491

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Chain	Residue	Modelled	Actual	Comment	Reference
Q	-11	ASP	-	expression tag	UNP P00491
Q	-10	LEU	-	expression tag	UNP P00491
Q	-9	TYR	-	expression tag	UNP P00491
Q	-8	ASP	-	expression tag	UNP P00491
Q	-7	ASP	-	expression tag	UNP P00491
Q	-6	ASP	-	expression tag	UNP P00491
Q	-5	ASP	-	expression tag	UNP P00491
Q	-4	LYS	-	expression tag	UNP P00491
Q	-3	ASP	-	expression tag	UNP P00491
Q	-2	PRO	-	expression tag	UNP P00491
Q	-1	THR	-	expression tag	UNP P00491
Q	0	LEU	-	expression tag	UNP P00491
Q	51	SER	GLY	conflict	UNP P00491
S	-34	MET	-	expression tag	UNP P00491
S	-33	ARG	-	expression tag	UNP P00491
S	-32	GLY	-	expression tag	UNP P00491
S	-31	SER	-	expression tag	UNP P00491
S	-30	HIS	-	expression tag	UNP P00491
S	-29	HIS	-	expression tag	UNP P00491
S	-28	HIS	-	expression tag	UNP P00491
S	-27	HIS	-	expression tag	UNP P00491
S	-26	HIS	-	expression tag	UNP P00491
S	-25	HIS	-	expression tag	UNP P00491
S	-24	GLY	-	expression tag	UNP P00491
S	-23	MET	-	expression tag	UNP P00491
S	-22	ALA	-	expression tag	UNP P00491
S	-21	SER	-	expression tag	UNP P00491
S	-20	MET	-	expression tag	UNP P00491
S	-19	THR	-	expression tag	UNP P00491
S	-18	GLY	-	expression tag	UNP P00491
S	-17	GLY	-	expression tag	UNP P00491
S	-16	GLN	-	expression tag	UNP P00491
S	-15	GLN	-	expression tag	UNP P00491
S	-14	MET	-	expression tag	UNP P00491
S	-13	GLY	-	expression tag	UNP P00491
S	-12	ARG	-	expression tag	UNP P00491
S	-11	ASP	-	expression tag	UNP P00491
S	-10	LEU	-	expression tag	UNP P00491
S	-9	TYR	-	expression tag	UNP P00491
S	-8	ASP	-	expression tag	UNP P00491
S	-7	ASP	-	expression tag	UNP P00491
S	-6	ASP	-	expression tag	UNP P00491

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Chain	Residue	Modelled	Actual	Comment	Reference
S	-5	ASP	-	expression tag	UNP P00491
S	-4	LYS	-	expression tag	UNP P00491
S	-3	ASP	-	expression tag	UNP P00491
S	-2	PRO	-	expression tag	UNP P00491
S	-1	THR	-	expression tag	UNP P00491
S	0	LEU	-	expression tag	UNP P00491
S	51	SER	GLY	conflict	UNP P00491
T	-34	MET	-	expression tag	UNP P00491
T	-33	ARG	-	expression tag	UNP P00491
T	-32	GLY	-	expression tag	UNP P00491
T	-31	SER	-	expression tag	UNP P00491
T	-30	HIS	-	expression tag	UNP P00491
T	-29	HIS	-	expression tag	UNP P00491
T	-28	HIS	-	expression tag	UNP P00491
T	-27	HIS	-	expression tag	UNP P00491
T	-26	HIS	-	expression tag	UNP P00491
T	-25	HIS	-	expression tag	UNP P00491
T	-24	GLY	-	expression tag	UNP P00491
T	-23	MET	-	expression tag	UNP P00491
T	-22	ALA	-	expression tag	UNP P00491
T	-21	SER	-	expression tag	UNP P00491
T	-20	MET	-	expression tag	UNP P00491
T	-19	THR	-	expression tag	UNP P00491
T	-18	GLY	-	expression tag	UNP P00491
T	-17	GLY	-	expression tag	UNP P00491
T	-16	GLN	-	expression tag	UNP P00491
T	-15	GLN	-	expression tag	UNP P00491
T	-14	MET	-	expression tag	UNP P00491
T	-13	GLY	-	expression tag	UNP P00491
T	-12	ARG	-	expression tag	UNP P00491
T	-11	ASP	-	expression tag	UNP P00491
T	-10	LEU	-	expression tag	UNP P00491
T	-9	TYR	-	expression tag	UNP P00491
T	-8	ASP	-	expression tag	UNP P00491
T	-7	ASP	-	expression tag	UNP P00491
T	-6	ASP	-	expression tag	UNP P00491
T	-5	ASP	-	expression tag	UNP P00491
T	-4	LYS	-	expression tag	UNP P00491
T	-3	ASP	-	expression tag	UNP P00491
T	-2	PRO	-	expression tag	UNP P00491
T	-1	THR	-	expression tag	UNP P00491
T	0	LEU	-	expression tag	UNP P00491

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Chain	Residue	Modelled	Actual	Comment	Reference
T	51	SER	GLY	conflict	UNP P00491
U	-34	MET	-	expression tag	UNP P00491
U	-33	ARG	-	expression tag	UNP P00491
U	-32	GLY	-	expression tag	UNP P00491
U	-31	SER	-	expression tag	UNP P00491
U	-30	HIS	-	expression tag	UNP P00491
U	-29	HIS	-	expression tag	UNP P00491
U	-28	HIS	-	expression tag	UNP P00491
U	-27	HIS	-	expression tag	UNP P00491
U	-26	HIS	-	expression tag	UNP P00491
U	-25	HIS	-	expression tag	UNP P00491
U	-24	GLY	-	expression tag	UNP P00491
U	-23	MET	-	expression tag	UNP P00491
U	-22	ALA	-	expression tag	UNP P00491
U	-21	SER	-	expression tag	UNP P00491
U	-20	MET	-	expression tag	UNP P00491
U	-19	THR	-	expression tag	UNP P00491
U	-18	GLY	-	expression tag	UNP P00491
U	-17	GLY	-	expression tag	UNP P00491
U	-16	GLN	-	expression tag	UNP P00491
U	-15	GLN	-	expression tag	UNP P00491
U	-14	MET	-	expression tag	UNP P00491
U	-13	GLY	-	expression tag	UNP P00491
U	-12	ARG	-	expression tag	UNP P00491
U	-11	ASP	-	expression tag	UNP P00491
U	-10	LEU	-	expression tag	UNP P00491
U	-9	TYR	-	expression tag	UNP P00491
U	-8	ASP	-	expression tag	UNP P00491
U	-7	ASP	-	expression tag	UNP P00491
U	-6	ASP	-	expression tag	UNP P00491
U	-5	ASP	-	expression tag	UNP P00491
U	-4	LYS	-	expression tag	UNP P00491
U	-3	ASP	-	expression tag	UNP P00491
U	-2	PRO	-	expression tag	UNP P00491
U	-1	THR	-	expression tag	UNP P00491
U	0	LEU	-	expression tag	UNP P00491
U	51	SER	GLY	conflict	UNP P00491
Y	-34	MET	-	expression tag	UNP P00491
Y	-33	ARG	-	expression tag	UNP P00491
Y	-32	GLY	-	expression tag	UNP P00491
Y	-31	SER	-	expression tag	UNP P00491
Y	-30	HIS	-	expression tag	UNP P00491

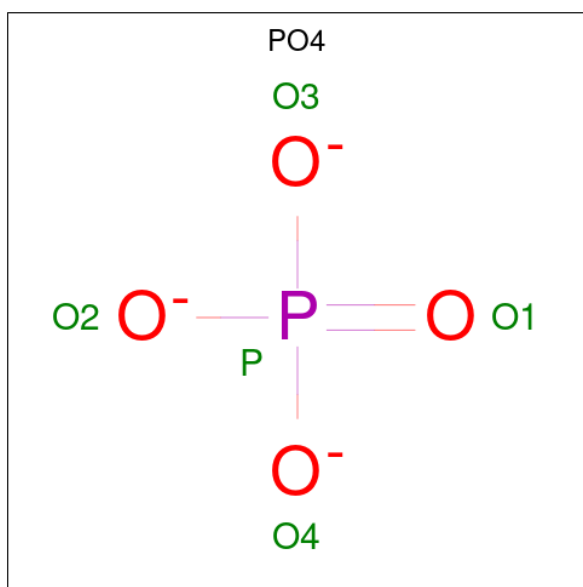*Continued on next page...*

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Chain	Residue	Modelled	Actual	Comment	Reference
Y	-29	HIS	-	expression tag	UNP P00491
Y	-28	HIS	-	expression tag	UNP P00491
Y	-27	HIS	-	expression tag	UNP P00491
Y	-26	HIS	-	expression tag	UNP P00491
Y	-25	HIS	-	expression tag	UNP P00491
Y	-24	GLY	-	expression tag	UNP P00491
Y	-23	MET	-	expression tag	UNP P00491
Y	-22	ALA	-	expression tag	UNP P00491
Y	-21	SER	-	expression tag	UNP P00491
Y	-20	MET	-	expression tag	UNP P00491
Y	-19	THR	-	expression tag	UNP P00491
Y	-18	GLY	-	expression tag	UNP P00491
Y	-17	GLY	-	expression tag	UNP P00491
Y	-16	GLN	-	expression tag	UNP P00491
Y	-15	GLN	-	expression tag	UNP P00491
Y	-14	MET	-	expression tag	UNP P00491
Y	-13	GLY	-	expression tag	UNP P00491
Y	-12	ARG	-	expression tag	UNP P00491
Y	-11	ASP	-	expression tag	UNP P00491
Y	-10	LEU	-	expression tag	UNP P00491
Y	-9	TYR	-	expression tag	UNP P00491
Y	-8	ASP	-	expression tag	UNP P00491
Y	-7	ASP	-	expression tag	UNP P00491
Y	-6	ASP	-	expression tag	UNP P00491
Y	-5	ASP	-	expression tag	UNP P00491
Y	-4	LYS	-	expression tag	UNP P00491
Y	-3	ASP	-	expression tag	UNP P00491
Y	-2	PRO	-	expression tag	UNP P00491
Y	-1	THR	-	expression tag	UNP P00491
Y	0	LEU	-	expression tag	UNP P00491
Y	51	SER	GLY	conflict	UNP P00491

- Molecule 2 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 (three-letter code: IM5) (formula: $C_{12}H_{17}N_5O_3$).
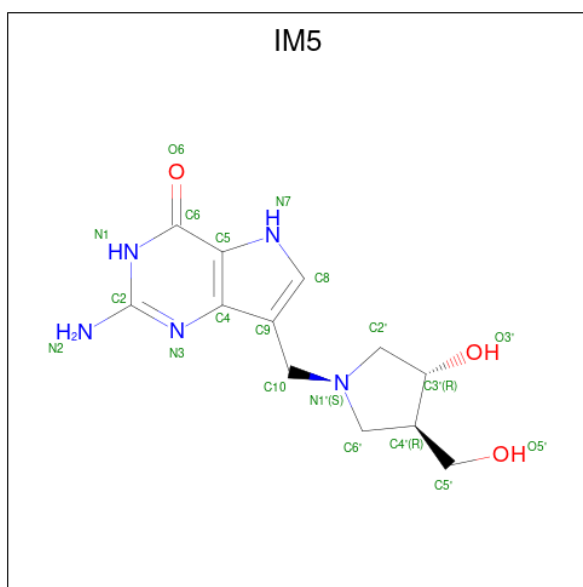
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	E	1	Total	C	N	O	0	0
			20	12	5	3		
2	Q	1	Total	C	N	O	0	0
			20	12	5	3		
2	S	1	Total	C	N	O	0	0
			20	12	5	3		
2	T	1	Total	C	N	O	0	0
			20	12	5	3		
2	U	1	Total	C	N	O	0	0
			20	12	5	3		
2	Y	1	Total	C	N	O	0	0
			20	12	5	3		

- Molecule 3 is PHOSPHATE ION (three-letter code: PO4) (formula: O_4P).

PO4

O3

O⁻

O2 O⁻ — P === O O1

P

O⁻

O4

Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	E	1	Total 5	O 4	P 1	0	0
3	E	1	Total 5	O 4	P 1	0	0
3	Q	1	Total 5	O 4	P 1	0	0
3	Q	1	Total 5	O 4	P 1	0	0
3	S	1	Total 5	O 4	P 1	0	0
3	S	1	Total 5	O 4	P 1	0	0
3	T	1	Total 5	O 4	P 1	0	0
3	T	1	Total 5	O 4	P 1	0	0
3	U	1	Total 5	O 4	P 1	0	0
3	Y	1	Total 5	O 4	P 1	0	0
3	Y	1	Total 5	O 4	P 1	0	0
3	Y	1	Total 5	O 4	P 1	0	0

• Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	E	16	Total 16	O 16	0	0
4	Q	18	Total 18	O 18	0	0
4	S	15	Total 15	O 15	0	0
4	T	10	Total 10	O 10	0	0
4	U	13	Total 13	O 13	0	0
4	Y	18	Total 18	O 18	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.
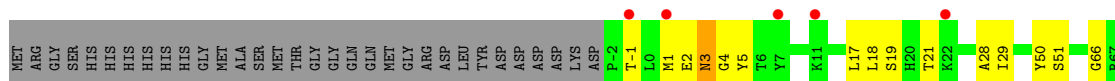
• Molecule 1: Purine nucleoside phosphorylase

Chain E:

• Molecule 1: Purine nucleoside phosphorylase

Chain Q:

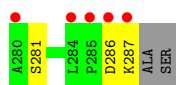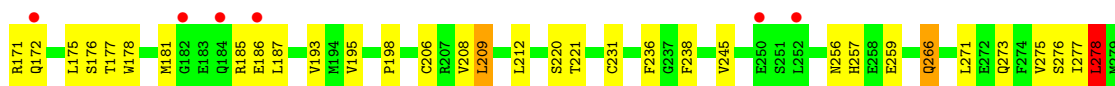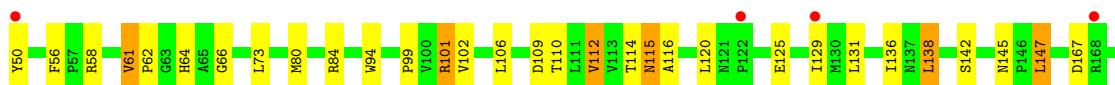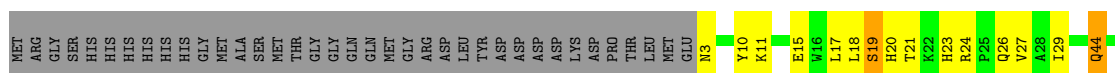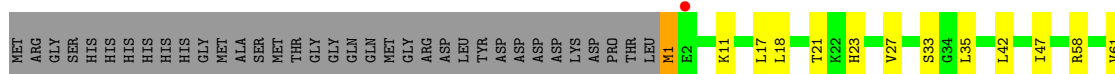• Molecule 1: Purine nucleoside phosphorylase

Chain S:

M181 G182 E183 Q184 R185 E186 L187 V193 M194 V195 C206 R207 V208 L209 Q210 M219 I226 V227 A228 R229 R234 V235 F236 G237 F238 V245 I246 M247 E250 S251 L252 E258 K265 Q269 Q273 F274 V275 S276 I277 L278 P285 ASP LYS ALA SER

• Molecule 1: Purine nucleoside phosphorylase

Chain T:

4%

69% 16% • 11%

MET ARG GLY SER HIS HIS HIS HIS HIS GLY MET ALA SER MET THR GLY GLY GLN GLN MET GLY ARG ASP LEU TYR ASP ASP ASP LYS ASP P-2 T-1 L0 M1 E2 N3 G4 Y5 T6 Y7 K11 L17 L18 S19 H20 T21 K22 A28 I29 Y50 S51 G66 R67

L68 V79 M87 F98 P99 V102 L106 V112 N115 A116 L120 K123 V126 L131 L138 P139 G140 F141 N145 P146 L147 P150 E153 R158 R168 Q172 R173 A174 L175 S176 T177 W178 M181 Q184 V193 M194 V195 A196

C206 L209 L212 V217 F236 L240 T241 T242 V245 I246 M247 E250 S251 L252 E253 K254 A255 N256 E259 V260 Q266 L271 I282 P283 L284 PRO ASP LYS ALA SER

• Molecule 1: Purine nucleoside phosphorylase

Chain U:

5%

63% 22% • 12%

MET ARG GLY SER HIS HIS HIS HIS HIS GLY MET ALA SER MET THR GLY GLY GLN GLN MET GLY ARG ASP LEU TYR ASP ASP ASP LYS ASP PRO THR LEU MET GLU N3 Y10 K11 E15 W16 L17 L18 S19 H20 T21 K22 H23 R24 P25 Q26 V27 A28 I29 Q44

Y50 F56 P57 R58 V61 P62 G63 H64 A65 G66 L73 M80 R84 W94 P99 V100 R101 V102 L106 D109 T110 L111 V112 V113 T114 N115 A116 L120 N121 P122 E125 I129 M130 L131 I136 N137 L138 S142 N145 P146 L147 D167 R168

R171 Q172 L175 S176 T177 W178 M181 G182 E183 Q184 R185 E186 L187 V193 M194 V195 P198 C206 R207 V208 L209 L212 S220 T221 C231 F236 G237 F238 V245 E250 S251 L252 N256 H257 E258 E259 Q266 L271 E272 Q273 F274 V275 S276 I277 L278 M279

A280 S281 L284 P285 D286 K287 ALA SER

• Molecule 1: Purine nucleoside phosphorylase

Chain Y:

2%

67% 19% • 12%

MET ARG GLY SER HIS HIS HIS HIS HIS GLY MET ALA SER MET THR GLY GLY GLN GLN MET GLY ARG ASP LEU TYR ASP ASP ASP LYS ASP PRO THR LEU M1 E2 K11 L17 L18 T21 K22 H23 V27 S33 G34 L35 L42 I47 R58 V61

H64 L68 V69 L73 M80 R84 F85 H86 M87 P92 K95 V96 T97 F98 P99 V100 R101 V102 L106 V112 N115 L120 F124 L131 H135 I136 N137 L138 P139 S142 N145 P146 L147 M170 R171 L175 S176 T177 W178 K179 G182

E183 Q184 R185 E186 E189 Y192 V195 F200 E205 C206 L209 S220 T221 V222 P223 V227 R234 V235 F236 S239 V245 K254 A255 N256 H257 E258 K265 S276 I277 L278 I282 P285 ASP LYS ALA SER

4　Data and refinement statistics　ⓘ

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α, β, γ	269.27Å　52.63Å　128.12Å 90.00°　90.33°　90.00°	Depositor
Resolution (Å)	19.91　–　2.30 19.91　–　2.30	Depositor EDS
% Data completeness (in resolution range)	98.9 (19.91-2.30) 98.9 (19.91-2.30)	Depositor EDS
R_{merge}	0.09	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.51 (at 2.30Å)	Xtriage
Refinement program	REFMAC 5.5.0109	Depositor
R, R_{free}	0.230　,　0.295 0.230　,　0.295	Depositor DCC
R_{free} test set	3982 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å^2)	42.0	Xtriage
Anisotropy	0.235	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.34 , 35.6	EDS
L-test for twinning[2]	$< |L| > = 0.51, < L^2 > = 0.35$	Xtriage
Estimated twinning fraction	0.004 for -h,-k,l	Xtriage
F_o,F_c correlation	0.94	EDS
Total number of atoms	13732	wwPDB-VP
Average B, all atoms (Å^2)	47.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.15% of the height of the origin peak. No significant pseudotranslation is detected.*

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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: IM5, PO4

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	E	0.70	0/2305	0.77	1/3120 (0.0%)
1	Q	0.68	0/2308	0.77	2/3123 (0.1%)
1	S	0.64	0/2290	0.74	1/3099 (0.0%)
1	T	0.62	0/2297	0.72	0/3108
1	U	0.67	1/2293 (0.0%)	0.71	1/3102 (0.0%)
1	Y	0.65	0/2282	0.75	2/3088 (0.1%)
All	All	0.66	1/13775 (0.0%)	0.74	7/18640 (0.0%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	U	231	CYS	CB-SG	-5.65	1.72	1.81

The worst 5 of 7 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	Y	101	ARG	NE-CZ-NH1	5.92	123.26	120.30
1	Q	101	ARG	NE-CZ-NH1	-5.62	117.49	120.30
1	Y	101	ARG	NE-CZ-NH2	-5.55	117.53	120.30
1	U	278	LEU	CA-CB-CG	5.45	127.84	115.30
1	Q	101	ARG	NE-CZ-NH2	5.41	123.01	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	E	2252	0	2233	62	0
1	Q	2256	0	2238	81	0
1	S	2238	0	2219	48	0
1	T	2245	0	2226	37	0
1	U	2241	0	2219	53	0
1	Y	2230	0	2208	45	0
2	E	20	0	17	1	0
2	Q	20	0	17	0	0
2	S	20	0	17	0	0
2	T	20	0	17	0	0
2	U	20	0	17	1	0
2	Y	20	0	17	0	0
3	E	10	0	0	0	0
3	Q	10	0	0	0	0
3	S	10	0	0	0	0
3	T	10	0	0	1	0
3	U	5	0	0	0	0
3	Y	15	0	0	0	0
4	E	16	0	0	1	0
4	Q	18	0	0	6	0
4	S	15	0	0	0	0
4	T	10	0	0	0	0
4	U	13	0	0	1	0
4	Y	18	0	0	1	0
All	All	13732	0	13445	298	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 11.

The worst 5 of 298 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:U:177:THR:HG21	1:U:277:ILE:CG2	1.80	1.10
1:Q:171[A]:ARG:HH21	1:Q:171[A]:ARG:HG3	1.13	1.07
1:T:184:GLN:H	1:T:184:GLN:HE21	1.02	0.97
1:U:177:THR:CG2	1:U:277:ILE:HG21	1.98	0.93
1:U:177:THR:HG21	1:U:277:ILE:HG23	1.52	0.92

There are no symmetry-related clashes.

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	E	286/324 (88%)	274 (96%)	12 (4%)	0	100	100
1	Q	286/324 (88%)	275 (96%)	10 (4%)	1 (0%)	41	50
1	S	284/324 (88%)	274 (96%)	10 (4%)	0	100	100
1	T	285/324 (88%)	274 (96%)	11 (4%)	0	100	100
1	U	284/324 (88%)	273 (96%)	10 (4%)	1 (0%)	34	42
1	Y	283/324 (87%)	276 (98%)	7 (2%)	0	100	100
All	All	1708/1944 (88%)	1646 (96%)	60 (4%)	2 (0%)	51	64

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	Q	181	MET
1	U	44	GLN

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	E	240/269 (89%)	212 (88%)	28 (12%)	5	6
1	Q	240/269 (89%)	210 (88%)	30 (12%)	4	5
1	S	238/269 (88%)	212 (89%)	26 (11%)	6	7
1	T	239/269 (89%)	216 (90%)	23 (10%)	8	10
1	U	238/269 (88%)	213 (90%)	25 (10%)	7	8

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	Y	237/269 (88%)	216 (91%)	21 (9%)	9	11
All	All	1432/1614 (89%)	1279 (89%)	153 (11%)	6	7

5 of 153 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	U	101	ARG
1	Y	138	LEU
1	U	138	LEU
1	U	286	ASP
1	Y	265	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 36 such sidechains are listed below:

Mol	Chain	Res	Type
1	U	256	ASN
1	Y	256	ASN
1	U	266	GLN
1	Y	115	ASN
1	Q	210	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates ⓘ

There are no monosaccharides in this entry.

5.6 Ligand geometry ⓘ

18 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	#$|Z| > 2$
3	PO4	S	290	-	4,4,4	1.33	1 (25%)	6,6,6	0.78	0
3	PO4	Y	290	-	4,4,4	0.90	0	6,6,6	0.89	0
3	PO4	S	292	-	4,4,4	0.79	0	6,6,6	1.11	0
2	IM5	S	291	-	18,22,22	0.77	0	18,32,32	1.42	3 (16%)
3	PO4	Y	291	-	4,4,4	0.87	0	6,6,6	0.53	0
3	PO4	Q	291	-	4,4,4	1.25	0	6,6,6	0.66	0
3	PO4	T	292	-	4,4,4	1.15	0	6,6,6	0.57	0
3	PO4	Y	293	-	4,4,4	0.92	0	6,6,6	0.90	0
2	IM5	U	290	-	18,22,22	0.83	1 (5%)	18,32,32	1.10	2 (11%)
2	IM5	Y	292	-	18,22,22	0.88	1 (5%)	18,32,32	1.39	3 (16%)
3	PO4	U	291	-	4,4,4	0.82	0	6,6,6	0.89	0
2	IM5	T	291	-	18,22,22	0.93	2 (11%)	18,32,32	1.23	3 (16%)
2	IM5	Q	290	-	18,22,22	1.15	2 (11%)	18,32,32	1.41	2 (11%)
3	PO4	E	292	-	4,4,4	0.93	0	6,6,6	0.34	0
2	IM5	E	290	-	18,22,22	0.88	1 (5%)	18,32,32	1.27	2 (11%)
3	PO4	T	290	-	4,4,4	0.90	0	6,6,6	0.82	0
3	PO4	Q	292	-	4,4,4	1.11	0	6,6,6	0.49	0
3	PO4	E	291	-	4,4,4	0.91	0	6,6,6	0.60	0

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	IM5	S	291	-	-	3/5/18/18	0/3/3/3
2	IM5	U	290	-	-	0/5/18/18	0/3/3/3
2	IM5	Y	292	-	-	2/5/18/18	0/3/3/3
2	IM5	T	291	-	-	3/5/18/18	0/3/3/3
2	IM5	Q	290	-	-	0/5/18/18	0/3/3/3
2	IM5	E	290	-	-	1/5/18/18	0/3/3/3

The worst 5 of 8 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	Q	290	IM5	C6-N1	-2.69	1.33	1.37
2	E	290	IM5	C6-N1	-2.45	1.34	1.37
2	Y	292	IM5	C4-N3	-2.36	1.33	1.38
2	T	291	IM5	C6-N1	-2.18	1.34	1.37
2	T	291	IM5	C4-N3	-2.15	1.34	1.38

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

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	U	290	IM5	C3'-C2'-N1'	-2.86	98.98	104.44
2	Q	290	IM5	C5-C6-N1	2.69	118.70	113.95
2	S	291	IM5	O6-C6-C5	-2.66	119.18	124.37
2	Q	290	IM5	C4-N3-C2	2.57	120.33	117.92
2	T	291	IM5	C9-C10-N1'	2.47	117.07	112.75

There are no chirality outliers.

5 of 9 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	S	291	IM5	C3'-C4'-C5'-O5'
2	S	291	IM5	C6'-C4'-C5'-O5'
2	T	291	IM5	C3'-C4'-C5'-O5'
2	T	291	IM5	C6'-C4'-C5'-O5'
2	Y	292	IM5	C9-C10-N1'-C6'

There are no ring outliers.

3 monomers are involved in 3 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	U	290	IM5	1	0
2	E	290	IM5	1	0
3	T	290	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 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 IM5 S 291

Bond lengths

Bond angles

Torsions

Rings

Ligand IM5 U 290

Bond lengths

Bond angles

Torsions

Rings

Ligand IM5 Y 292

Bond lengths

Bond angles

Torsions

Rings

Ligand IM5 T 291

Bond lengths

Bond angles

Torsions

Rings

Ligand IM5 Q 290

Bond lengths

Bond angles

Torsions

Rings

Ligand IM5 E 290

Bond lengths

Bond angles

Torsions

Rings
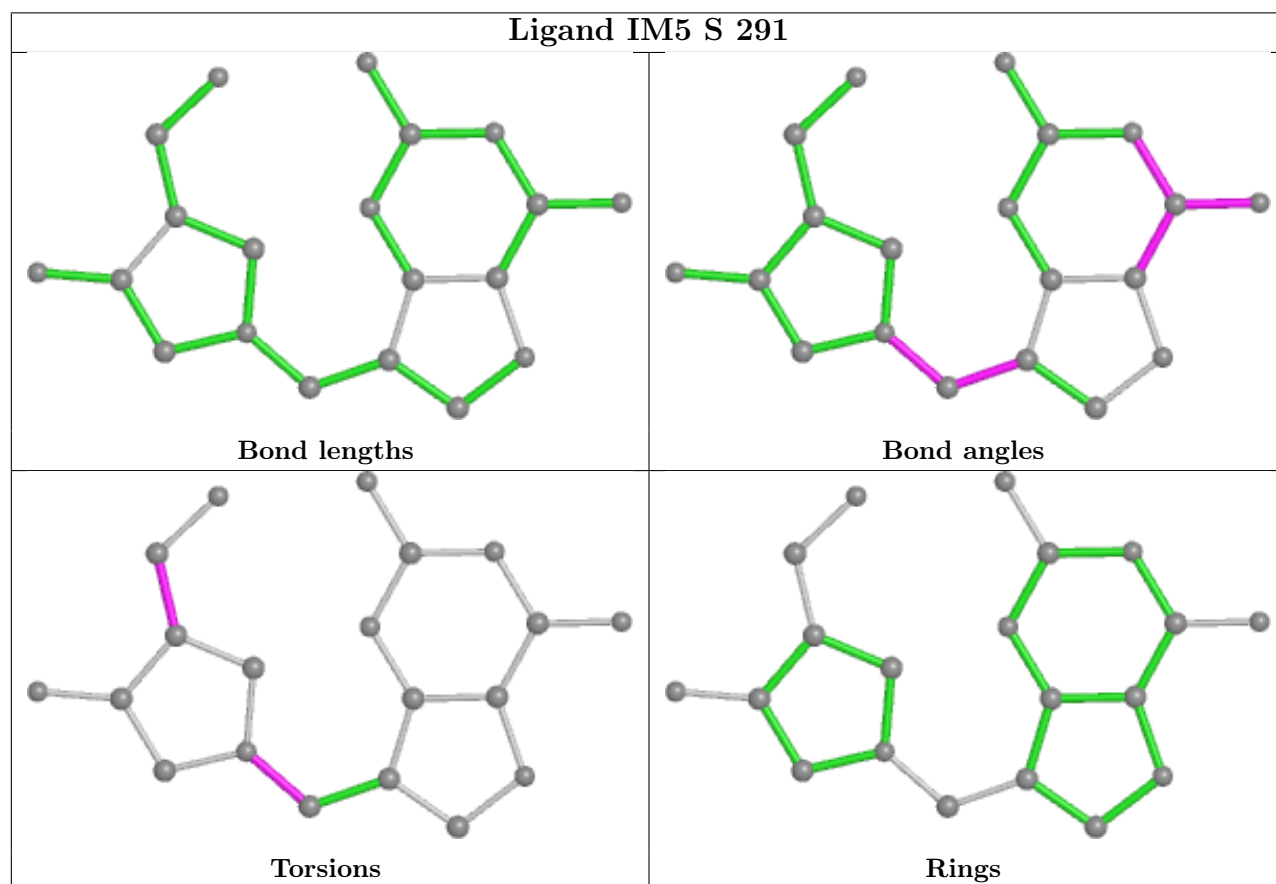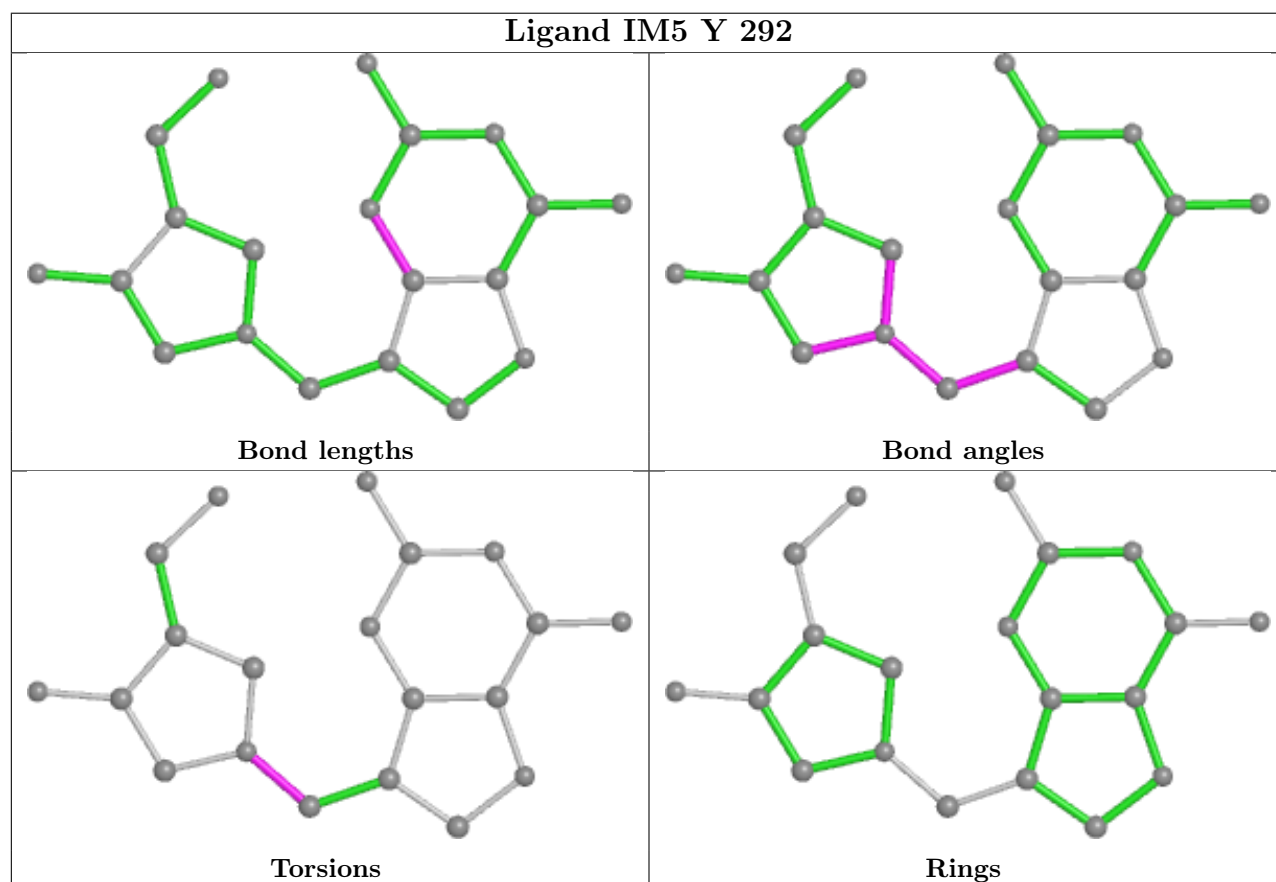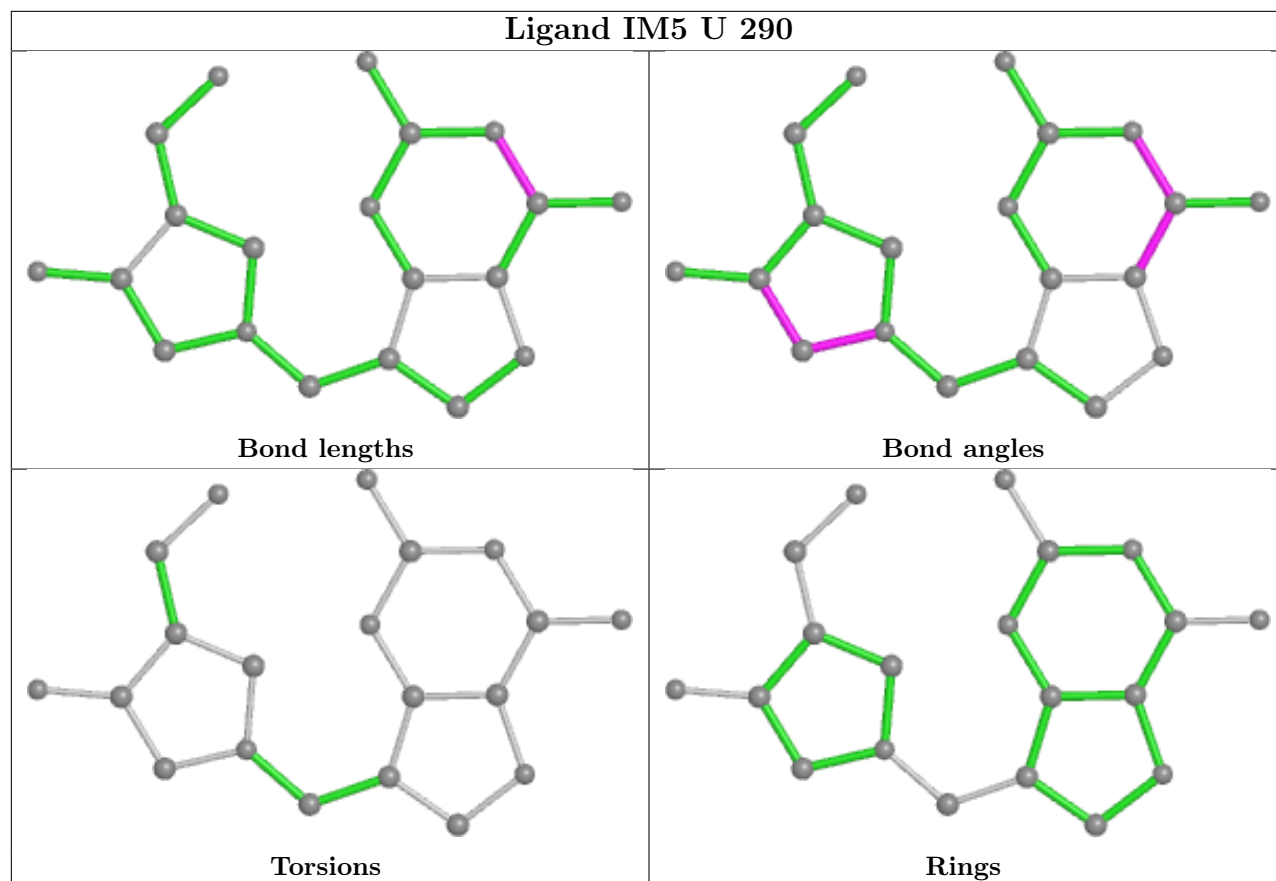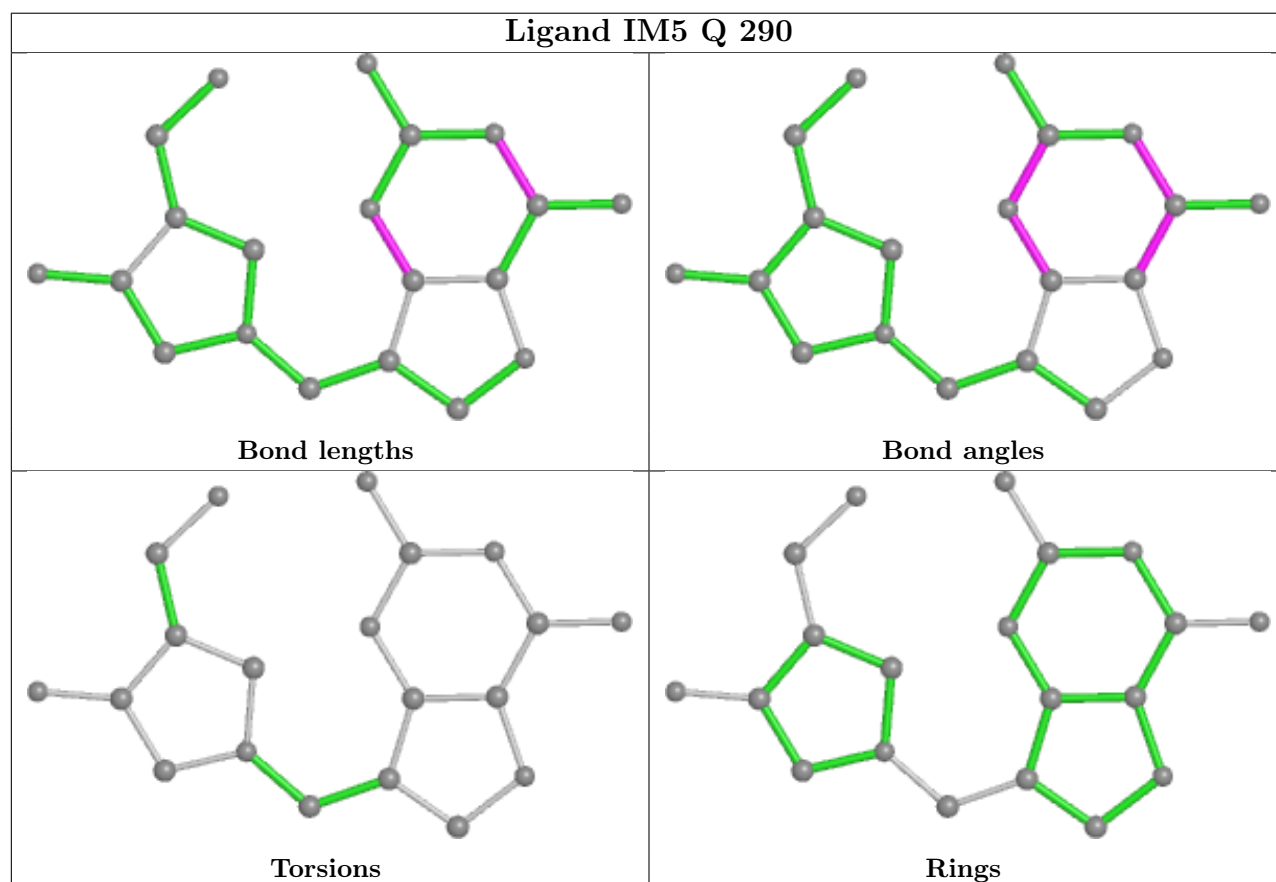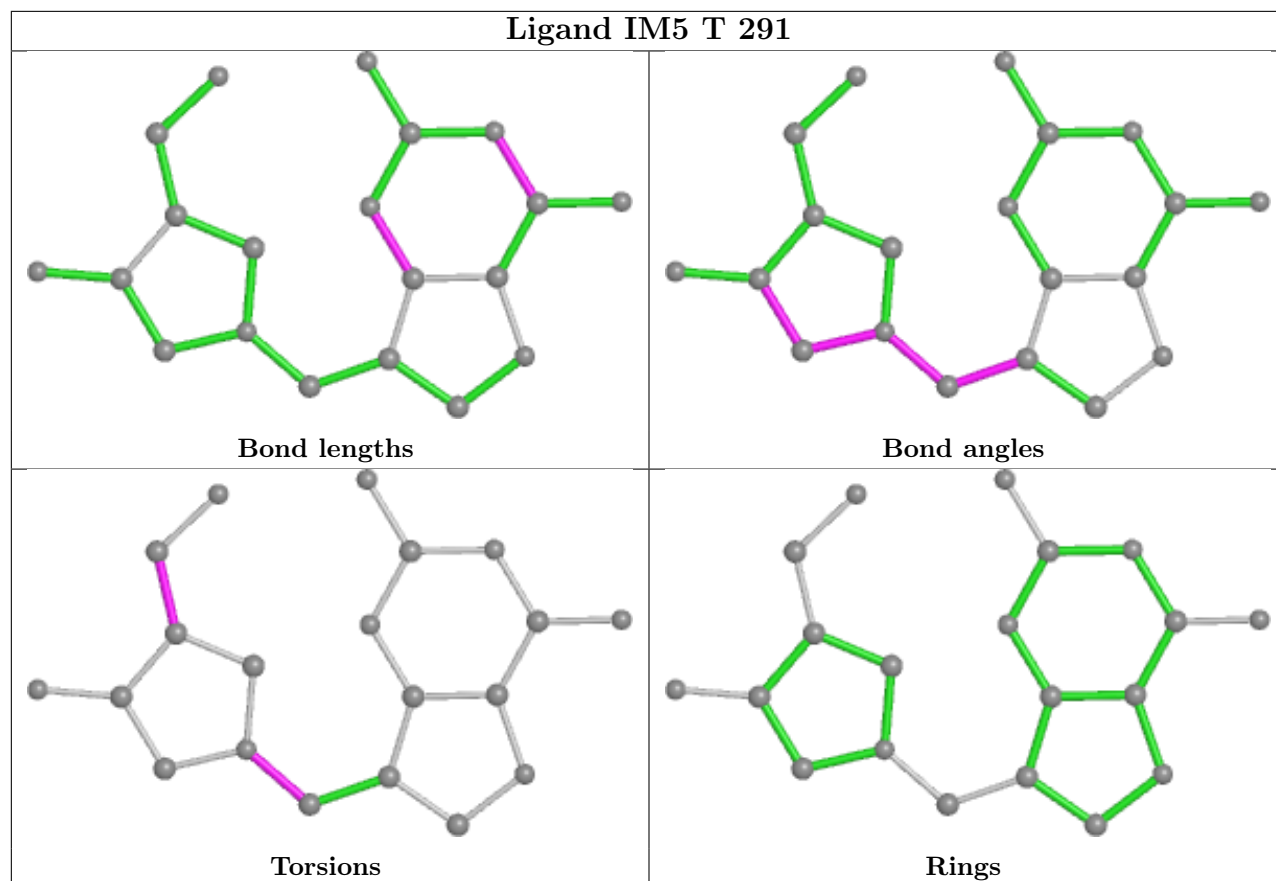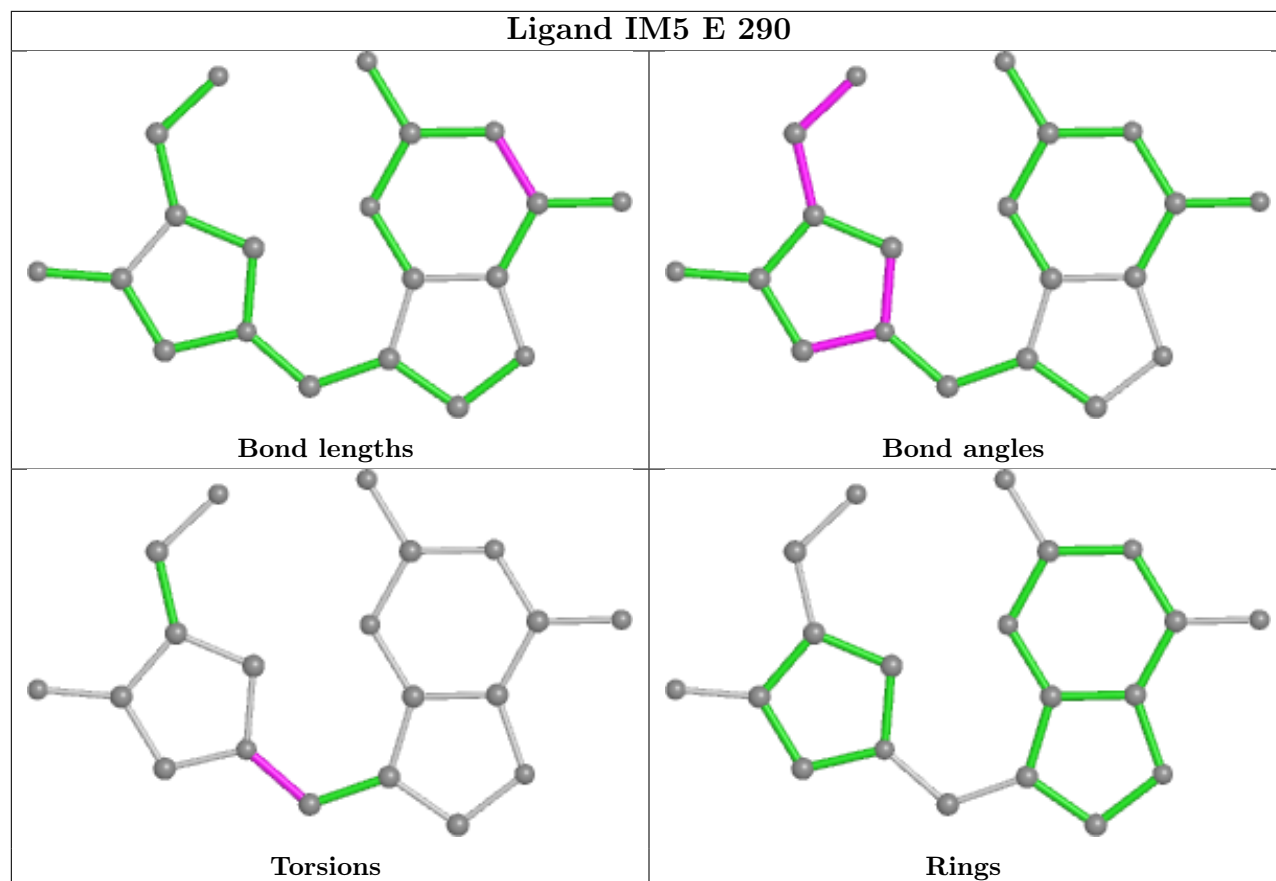
5.7 Other polymers (i)

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 ⓘ

6.1 Protein, DNA and RNA chains ⓘ

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

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2			OWAB(Å^2)	Q<0.9
1	E	288/324 (88%)	0.12	6 (2%)	63	70	20, 45, 67, 80	0
1	Q	287/324 (88%)	-0.01	6 (2%)	63	70	25, 42, 62, 81	0
1	S	286/324 (88%)	0.02	13 (4%)	33	40	27, 44, 65, 86	0
1	T	287/324 (88%)	0.19	12 (4%)	36	43	28, 51, 65, 77	0
1	U	285/324 (87%)	0.22	15 (5%)	26	33	23, 48, 72, 83	0
1	Y	285/324 (87%)	0.03	5 (1%)	68	74	31, 42, 63, 72	0
All	All	1718/1944 (88%)	0.09	57 (3%)	46	53	20, 45, 68, 86	0

The worst 5 of 57 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	E	182	GLY	6.9
1	Q	181	MET	6.1
1	S	184	GLN	5.7
1	Q	184	GLN	5.6
1	S	180	GLN	4.7

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

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

6.3 Carbohydrates ⓘ

There are no monosaccharides 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
3	PO4	E	292	5/5	0.94	0.18	64,64,66,67	0
2	IM5	U	290	20/20	0.95	0.14	32,36,39,41	0
2	IM5	E	290	20/20	0.95	0.16	33,38,42,45	0
3	PO4	Y	291	5/5	0.95	0.33	95,95,95,95	0
2	IM5	T	291	20/20	0.96	0.18	29,33,38,43	0
3	PO4	Q	292	5/5	0.96	0.20	67,67,68,68	0
2	IM5	Y	292	20/20	0.96	0.17	34,36,39,41	0
2	IM5	Q	290	20/20	0.97	0.10	26,30,37,37	0
3	PO4	S	290	5/5	0.97	0.17	48,49,49,50	0
3	PO4	T	290	5/5	0.97	0.18	66,66,66,67	0
3	PO4	Y	290	5/5	0.97	0.10	62,62,62,63	0
2	IM5	S	291	20/20	0.97	0.13	32,36,39,42	0
3	PO4	U	291	5/5	0.98	0.13	42,42,44,44	0
3	PO4	S	292	5/5	0.98	0.13	39,39,41,42	0
3	PO4	T	292	5/5	0.98	0.12	42,44,46,47	0
3	PO4	E	291	5/5	0.99	0.13	36,37,38,41	0
3	PO4	Q	291	5/5	0.99	0.12	35,36,37,40	0
3	PO4	Y	293	5/5	0.99	0.10	35,35,36,36	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 U 290:

$2mF_o\text{-}DF_c$ (at 0.7 rmsd) in gray
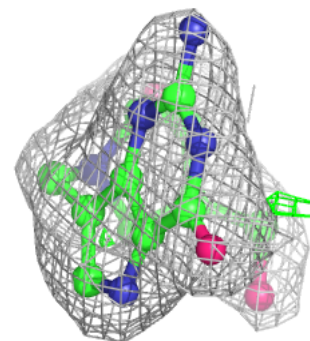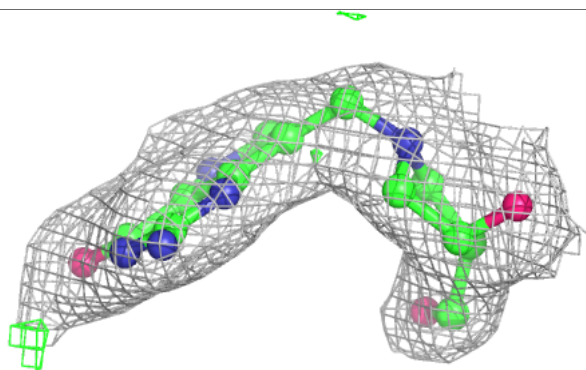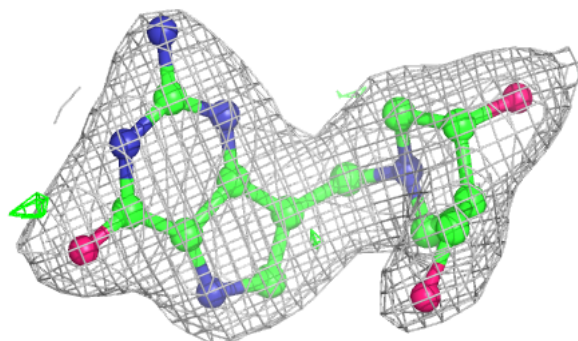$mF_o\text{-}DF_c$ (at 3 rmsd) in purple (negative)
and green (positive)
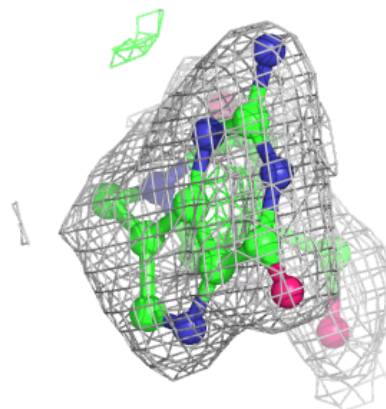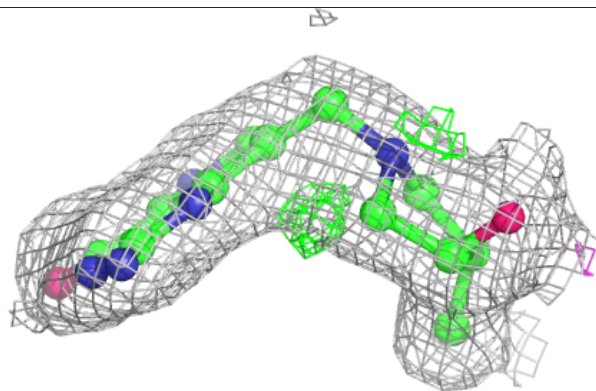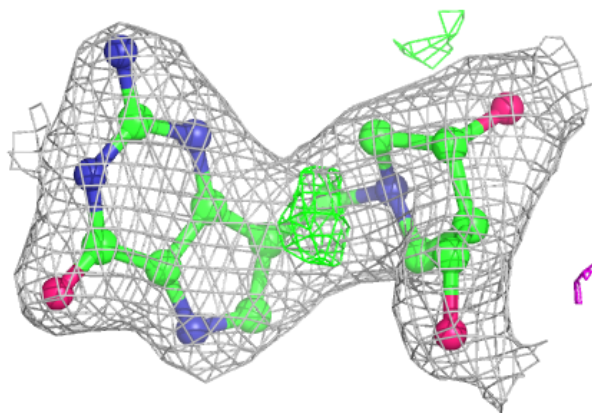
Electron density around IM5 E 290:

$2mF_o\text{-}DF_c$ (at 0.7 rmsd) in gray
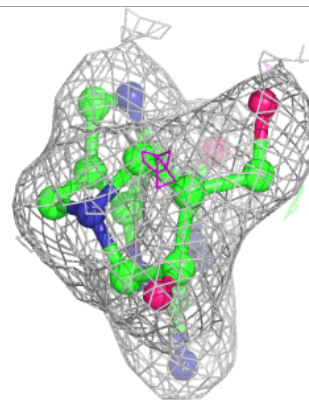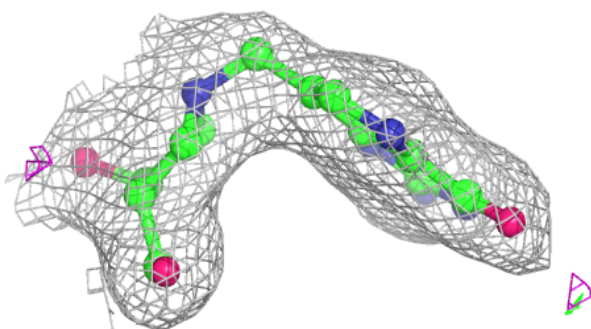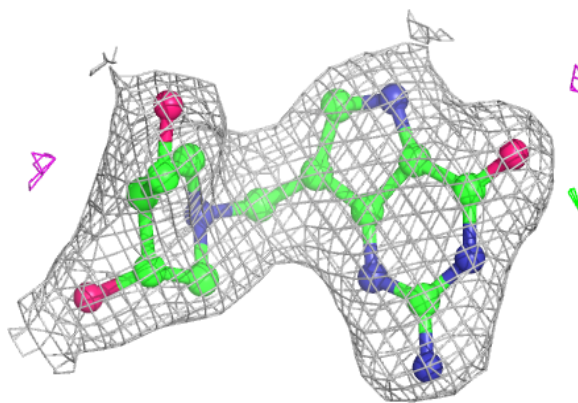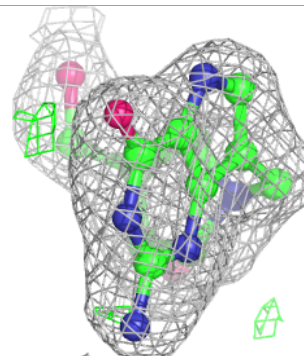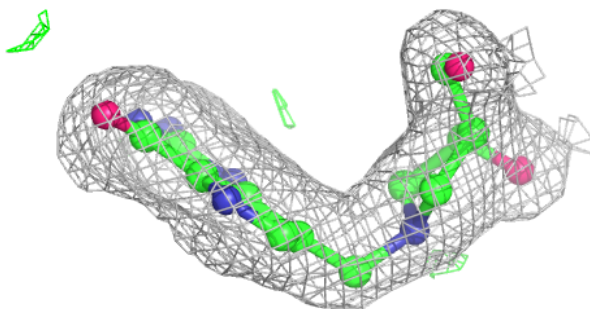$mF_o\text{-}DF_c$ (at 3 rmsd) in purple (negative)
and green (positive)
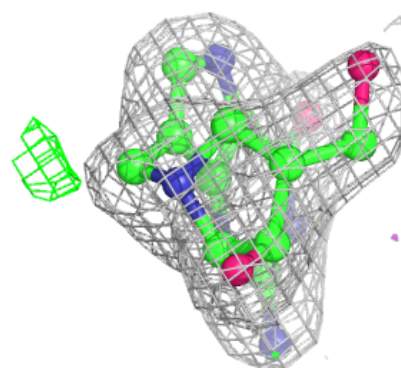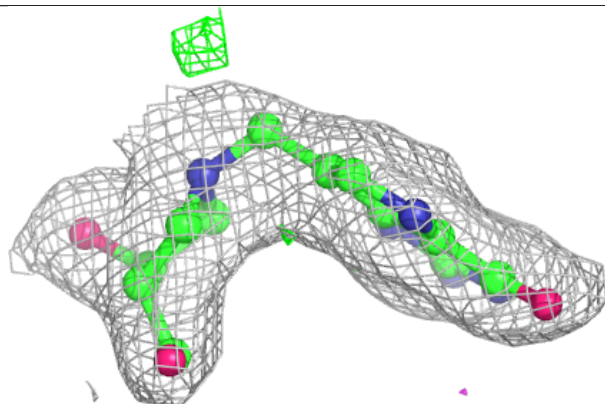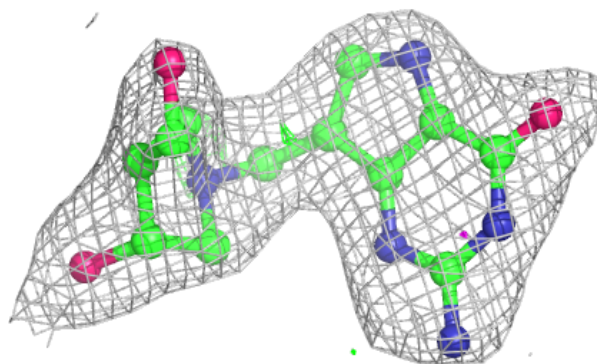
Electron density around IM5 T 291:

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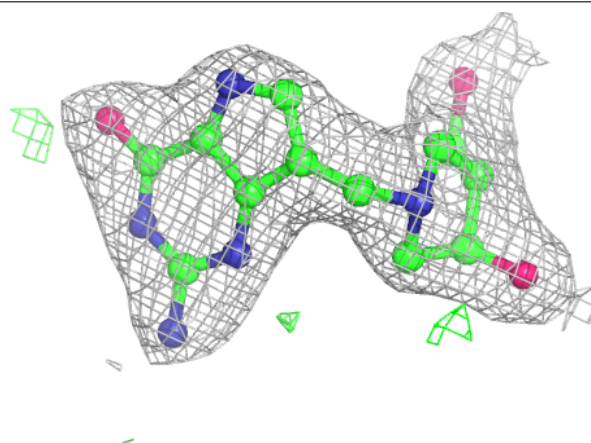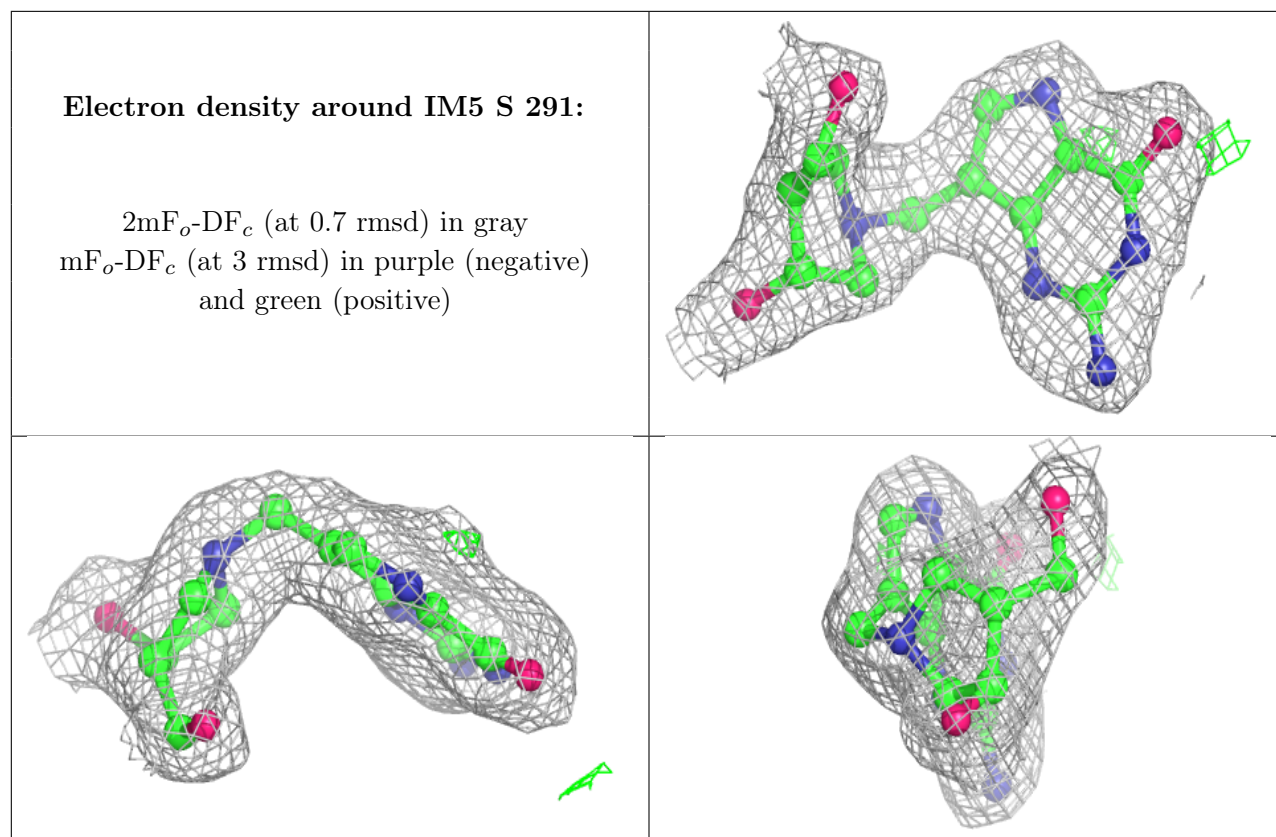$mF_o\text{-}DF_c$ (at 3 rmsd) in purple (negative)
and green (positive)

Electron density around IM5 Y 292:

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

Electron density around IM5 Q 290:

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

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Electron density around IM5 S 291:

$2mF_o$-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.