WORLDWIDE wwPDB PROTEIN DATA BANK

Full wwPDB X-ray Structure Validation Report ⓘ

Dec 10, 2024 – 04:04 PM EST

PDB ID	:	9MF6
Title	:	Crystal Structure of P y r o p h o s p h a t e - f r u c t o s e 6-phosphate 1-phosphotransferase 1 (Pfk1) from Trichomonas vaginalis (ADP/5-O-phosp hono-alpha-D-ribofuranose complex)
Authors	:	Seattle Structural Genomics Center for Infectious Disease; Seattle Structural Genomics Center for Infectious Disease (SSGCID)
Deposited on	:	2024-12-09
Resolution	:	2.65 Å(reported)

The following versions of software and data (see references ①) were used in the production of this report:

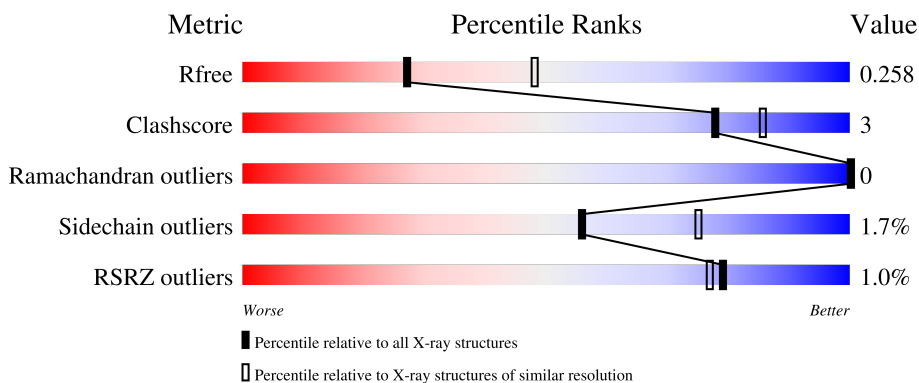|		
MolProbity	:	4.02b-467
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	1.21
EDS	:	3.0
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.004 (Gargrove)
Density-Fitness	:	1.0.11
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.40

1   Overall quality at a glance ⓘ

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

The reported resolution of this entry is 2.65 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.

Metric	Percentile Ranks	Value
Rfree		0.258
Clashscore		3
Ramachandran outliers		0
Sidechain outliers		1.7%
RSRZ outliers		1.0%

Worse ___ *Better*

▮ Percentile relative to all X-ray structures
◻ Percentile relative to X-ray structures of similar resolution

Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	164625	1003 (2.66-2.66)
Clashscore	180529	1063 (2.66-2.66)
Ramachandran outliers	177936	1052 (2.66-2.66)
Sidechain outliers	177891	1052 (2.66-2.66)
RSRZ outliers	164620	1003 (2.66-2.66)

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

Mol	Chain	Length	Quality of chain
1	A	434	2% / 92% · ·
1	B	434	90% 7% ·
1	C	434	% / 91% 5% ·
1	D	434	2% / 88% 8% ·

WORLDWIDE PDB
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2 Entry composition ⓘ

There are 6 unique types of molecules in this entry. The entry contains 12626 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 Pyrophosphate--fructose 6-phosphate 1-phosphotransferase 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	418	Total 3096	C 1966	N 534	O 580	S 16	0	1	0
1	B	423	Total 3137	C 1993	N 543	O 584	S 17	0	0	0
1	C	420	Total 3131	C 1995	N 540	O 579	S 17	0	0	0
1	D	417	Total 3076	C 1952	N 535	O 572	S 17	0	0	0

There are 32 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-7	MET	-	initiating methionine	UNP O61068
A	-6	ALA	-	expression tag	UNP O61068
A	-5	HIS	-	expression tag	UNP O61068
A	-4	HIS	-	expression tag	UNP O61068
A	-3	HIS	-	expression tag	UNP O61068
A	-2	HIS	-	expression tag	UNP O61068
A	-1	HIS	-	expression tag	UNP O61068
A	0	HIS	-	expression tag	UNP O61068
B	-7	MET	-	initiating methionine	UNP O61068
B	-6	ALA	-	expression tag	UNP O61068
B	-5	HIS	-	expression tag	UNP O61068
B	-4	HIS	-	expression tag	UNP O61068
B	-3	HIS	-	expression tag	UNP O61068
B	-2	HIS	-	expression tag	UNP O61068
B	-1	HIS	-	expression tag	UNP O61068
B	0	HIS	-	expression tag	UNP O61068
C	-7	MET	-	initiating methionine	UNP O61068
C	-6	ALA	-	expression tag	UNP O61068
C	-5	HIS	-	expression tag	UNP O61068
C	-4	HIS	-	expression tag	UNP O61068
C	-3	HIS	-	expression tag	UNP O61068

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Chain	Residue	Modelled	Actual	Comment	Reference
C	-2	HIS	-	expression tag	UNP O61068
C	-1	HIS	-	expression tag	UNP O61068
C	0	HIS	-	expression tag	UNP O61068
D	-7	MET	-	initiating methionine	UNP O61068
D	-6	ALA	-	expression tag	UNP O61068
D	-5	HIS	-	expression tag	UNP O61068
D	-4	HIS	-	expression tag	UNP O61068
D	-3	HIS	-	expression tag	UNP O61068
D	-2	HIS	-	expression tag	UNP O61068
D	-1	HIS	-	expression tag	UNP O61068
D	0	HIS	-	expression tag	UNP O61068

- Molecule 2 is 5-O-phosphono-alpha-D-ribofuranose (three-letter code: HSX) (formula: $C_5H_{11}O_8P$) (labeled as "Ligand of Interest" by depositor).

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	A	1	Total 14	C 5	O 8	P 1	0	0
2	B	1	Total 14	C 5	O 8	P 1	0	0
2	C	1	Total 14	C 5	O 8	P 1	0	0
2	D	1	Total 14	C 5	O 8	P 1	0	0

- Molecule 3 is ADENOSINE MONOPHOSPHATE (three-letter code: AMP) (formula: $C_{10}H_{14}N_5O_7P$) (labeled as "Ligand of Interest" by depositor).
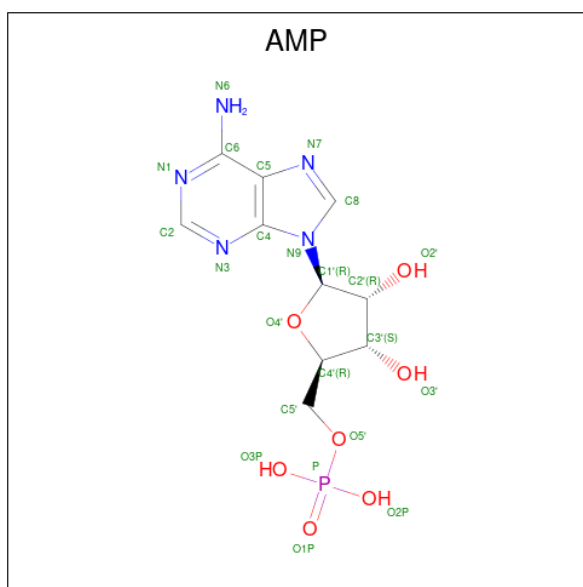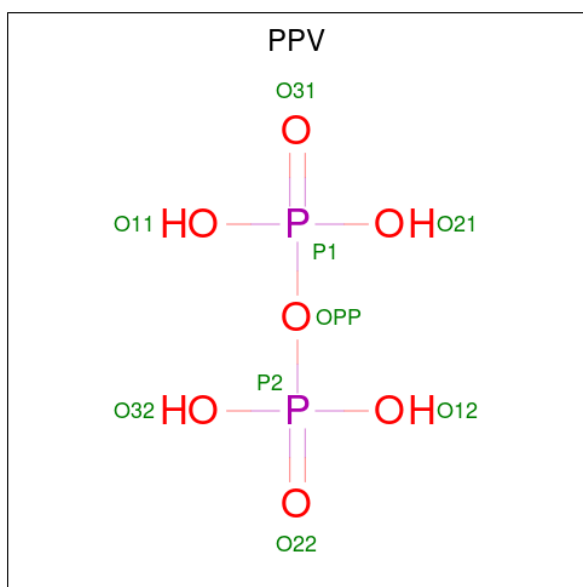
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
3	A	1	Total	C	N	O	P	0	0
			23	10	5	7	1		
3	A	1	Total	C	N	O	P	0	0
			23	10	5	7	1		
3	B	1	Total	C	N	O	P	0	0
			23	10	5	7	1		
3	B	1	Total	C	N	O	P	0	0
			23	10	5	7	1		

- Molecule 4 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	1	Total	Mg	0	0
			1	1		

- Molecule 5 is PYROPHOSPHATE (three-letter code: PPV) (formula: $H_4O_7P_2$).

PPV

O31

O

O11 HO — P — OH O21

P1

O OPP

P2

O32 HO — P — OH O12

O

O22

Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	A	1	Total	O	P	0	0
			9	7	2		

- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	5	Total	O	0	0
			5	5		
6	B	10	Total	O	0	0
			10	10		
6	C	9	Total	O	0	0
			9	9		
6	D	4	Total	O	0	0
			4	4		

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.

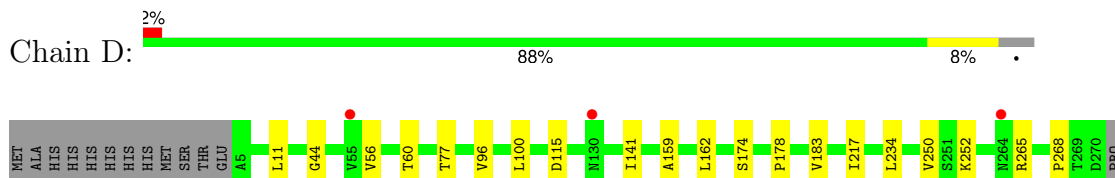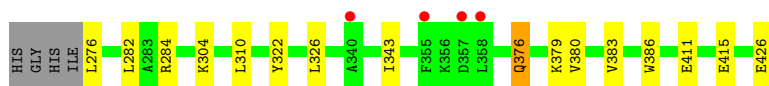- Molecule 1: Pyrophosphate--fructose 6-phosphate 1-phosphotransferase 1
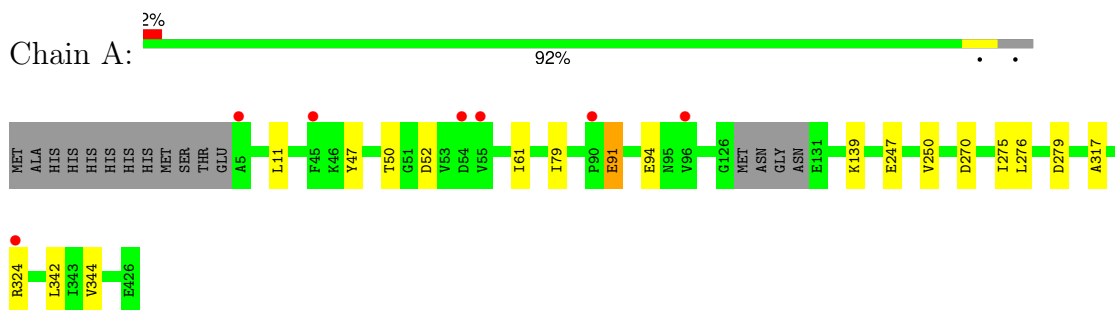
Chain A:

- Molecule 1: Pyrophosphate--fructose 6-phosphate 1-phosphotransferase 1

Chain B:

- Molecule 1: Pyrophosphate--fructose 6-phosphate 1-phosphotransferase 1

Chain C:

- Molecule 1: Pyrophosphate--fructose 6-phosphate 1-phosphotransferase 1

Chain D:
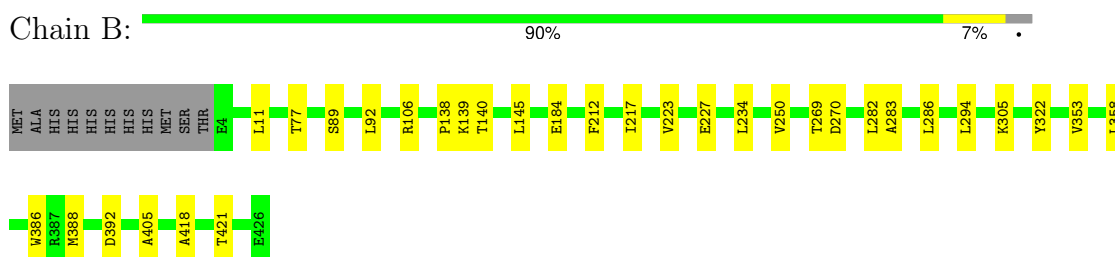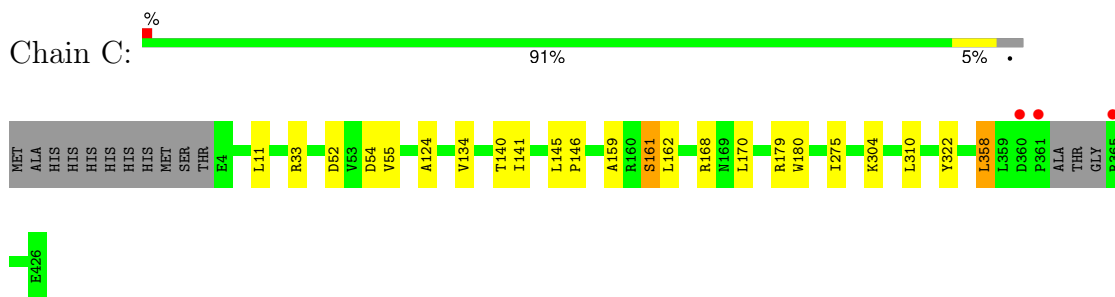
4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 43 21 2	Depositor
Cell constants a, b, c, α, β, γ	86.96Å 86.96Å 473.87Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	48.96 – 2.65 48.96 – 2.65	Depositor EDS
% Data completeness (in resolution range)	100.0 (48.96-2.65) 100.0 (48.96-2.65)	Depositor EDS
R_{merge}	0.10	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.85 (at 2.65Å)	Xtriage
Refinement program	PHENIX dev_5533	Depositor
R, R_{free}	0.208 , 0.263 0.207 , 0.258	Depositor DCC
R_{free} test set	2728 reflections (5.01%)	wwPDB-VP
Wilson B-factor (Å^2)	78.8	Xtriage
Anisotropy	0.006	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.31 , 59.6	EDS
L-test for twinning[2]	$< \lvert L \rvert > = 0.50$, $< L^2 > = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.95	EDS
Total number of atoms	12626	wwPDB-VP
Average B, all atoms (Å^2)	89.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.70% 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 $< \lvert L \rvert >$, $< L^2 >$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality (i)

5.1 Standard geometry (i)

Bond lengths and bond angles in the following residue types are not validated in this section: AMP, PPV, MG, HSX

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	0.26	0/3156	0.49	0/4287
1	B	0.25	0/3193	0.49	0/4335
1	C	0.26	0/3190	0.49	0/4331
1	D	0.25	0/3129	0.50	0/4246
All	All	0.25	0/12668	0.49	0/17199

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts (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	3096	0	3008	12	0
1	B	3137	0	3085	24	0
1	C	3131	0	3089	13	0
1	D	3076	0	3014	18	0
2	A	14	0	0	0	0
2	B	14	0	0	0	0
2	C	14	0	0	0	0
2	D	14	0	0	0	0
3	A	46	0	24	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	B	46	0	24	2	0
4	A	1	0	0	0	0
5	A	9	0	0	0	0
6	A	5	0	0	0	0
6	B	10	0	0	0	0
6	C	9	0	0	0	0
6	D	4	0	0	0	0
All	All	12626	0	12244	66	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 3.

All (66) 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:B:353:VAL:HG11	1:B:358:LEU:HD21	1.64	0.77
1:A:47:TYR:O	1:A:50:THR:HG22	1.84	0.77
1:D:250:VAL:HG23	1:D:282:LEU:HD12	1.71	0.71
1:B:282:LEU:HD12	1:B:286:LEU:HD23	1.70	0.71
1:A:50:THR:HG23	1:A:52:ASP:H	1.59	0.67
1:B:138:PRO:HB2	1:B:145:LEU:HD11	1.79	0.65
1:B:282:LEU:HD12	1:B:286:LEU:CD2	2.28	0.63
1:A:61:ILE:HD11	1:A:79:ILE:HG22	1.82	0.61
1:D:376:GLN:O	1:D:380:VAL:HG23	2.00	0.61
1:B:89:SER:HB3	1:B:92:LEU:HD12	1.83	0.60
1:D:234:LEU:HD13	1:D:234:LEU:O	2.03	0.58
1:B:234:LEU:HD13	1:B:234:LEU:O	2.03	0.57
1:D:326:LEU:HD22	1:D:343:ILE:HG22	1.88	0.56
1:B:250:VAL:HG23	1:B:282:LEU:HD22	1.87	0.56
1:D:96:VAL:O	1:D:100:LEU:HD12	2.06	0.55
1:A:275:ILE:HD12	1:A:275:ILE:H	1.71	0.55
1:D:56:VAL:O	1:D:60:THR:HG23	2.06	0.55
1:B:418:ALA:O	1:B:421:THR:HG22	2.07	0.55
1:A:270:ASP:HB3	1:A:276:LEU:HD21	1.88	0.55
1:D:250:VAL:CG2	1:D:282:LEU:HD12	2.36	0.53
1:B:223:VAL:HG22	1:B:286:LEU:CD1	2.38	0.53
1:D:96:VAL:HG12	1:D:100:LEU:CD1	2.37	0.53
1:B:282:LEU:O	1:B:286:LEU:HD23	2.09	0.52
1:A:275:ILE:HD12	1:A:275:ILE:N	2.24	0.52
1:C:170:LEU:HD11	1:C:304:LYS:HG2	1.91	0.52
1:C:141:ILE:HD11	1:C:159:ALA:HB2	1.92	0.52

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:124:ALA:HB2	1:C:134:VAL:HG21	1.92	0.52
1:B:212:PHE:CG	1:B:217:ILE:HD11	2.44	0.52
1:D:268:PRO:HB2	1:D:276:LEU:HD12	1.93	0.51
1:D:141:ILE:HD11	1:D:159:ALA:HB2	1.94	0.49
1:B:89:SER:CB	1:B:92:LEU:HD12	2.43	0.48
1:B:234:LEU:HD12	1:B:405:ALA:HB1	1.95	0.48
1:B:388:MET:HE3	1:B:392:ASP:HB3	1.95	0.48
1:B:269:THR:HG22	1:B:270:ASP:O	2.14	0.48
1:C:358:LEU:H	1:C:358:LEU:HD12	1.78	0.48
1:C:145:LEU:HD13	1:C:146:PRO:HD2	1.97	0.47
1:B:386:TRP:HA	3:B:502:AMP:HN62	1.80	0.47
1:C:275:ILE:HD12	1:C:275:ILE:H	1.80	0.47
1:C:52:ASP:OD2	1:C:55:VAL:HG23	2.14	0.47
1:D:217:ILE:HD11	1:D:252:LYS:HB3	1.98	0.46
1:D:411:GLU:O	1:D:415:GLU:HG2	2.15	0.46
1:A:91:GLU:O	1:A:94:GLU:N	2.48	0.46
1:B:353:VAL:CG1	1:B:358:LEU:HD21	2.39	0.46
1:B:212:PHE:CD1	1:B:217:ILE:HD11	2.51	0.46
1:B:227:GLU:HG3	1:B:294:LEU:HD11	1.98	0.45
1:D:183:VAL:HA	1:D:304:LYS:O	2.16	0.45
1:B:184:GLU:HB2	1:B:283:ALA:HB2	1.98	0.45
1:D:379:LYS:O	1:D:383:VAL:HG23	2.17	0.44
1:B:11:LEU:HD12	1:B:11:LEU:C	2.37	0.44
1:A:247:GLU:O	1:A:250:VAL:HG22	2.17	0.44
1:B:139:LYS:O	1:B:140:THR:HG23	2.18	0.43
1:C:179:ARG:HG2	1:C:180:TRP:N	2.32	0.43
1:C:140:THR:CG2	1:C:145:LEU:HD23	2.49	0.43
1:A:50:THR:HG23	1:A:52:ASP:N	2.32	0.42
1:D:11:LEU:HD13	1:D:44:GLY:HA2	2.00	0.42
1:D:174:SER:O	1:D:178:PRO:HA	2.18	0.42
3:B:503:AMP:HN62	1:D:386:TRP:HA	1.84	0.42
1:C:140:THR:HG23	1:C:140:THR:O	2.20	0.42
1:C:162:LEU:HD23	1:C:310:LEU:HD23	2.00	0.42
1:A:342:LEU:HD23	1:A:344:VAL:HG13	2.01	0.41
1:A:317:ALA:HB2	1:C:161:SER:HA	2.02	0.41
1:D:162:LEU:HD23	1:D:310:LEU:HD23	2.03	0.41
1:B:138:PRO:CB	1:B:145:LEU:HD11	2.50	0.41
1:B:227:GLU:HG3	1:B:294:LEU:HD21	2.03	0.41
1:C:11:LEU:C	1:C:11:LEU:HD12	2.41	0.41
1:A:11:LEU:HD12	1:A:11:LEU:C	2.41	0.40

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	A	415/434 (96%)	407 (98%)	8 (2%)	0	100	100
1	B	421/434 (97%)	408 (97%)	13 (3%)	0	100	100
1	C	416/434 (96%)	408 (98%)	8 (2%)	0	100	100
1	D	413/434 (95%)	408 (99%)	5 (1%)	0	100	100
All	All	1665/1736 (96%)	1631 (98%)	34 (2%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 Protein sidechains ⓘ

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	308/355 (87%)	303 (98%)	5 (2%)	58	76
1	B	315/355 (89%)	311 (99%)	4 (1%)	65	80
1	C	318/355 (90%)	312 (98%)	6 (2%)	52	72
1	D	306/355 (86%)	299 (98%)	7 (2%)	45	67
All	All	1247/1420 (88%)	1225 (98%)	22 (2%)	56	73

All (22) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	91	GLU
1	A	139	LYS

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Mol	Chain	Res	Type
1	A	279	ASP
1	A	324[A]	ARG
1	A	324[B]	ARG
1	B	77	THR
1	B	106	ARG
1	B	305	LYS
1	B	322	TYR
1	C	33	ARG
1	C	54	ASP
1	C	161	SER
1	C	168	ARG
1	C	322	TYR
1	C	358	LEU
1	D	77	THR
1	D	115	ASP
1	D	265	ARG
1	D	284	ARG
1	D	322	TYR
1	D	376	GLN
1	D	426	GLU

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

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

Of 10 ligands modelled in this entry, 1 is monoatomic - leaving 9 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	$\#|Z| > 2$
2	HSX	D	501	-	14,14,14	0.61	0	19,21,21	0.53	0
3	AMP	B	503	-	21,25,25	0.68	0	23,38,38	0.83	1 (4%)
2	HSX	B	501	-	14,14,14	0.49	0	19,21,21	0.56	0
3	AMP	B	502	-	21,25,25	0.69	0	23,38,38	0.81	1 (4%)
3	AMP	A	503	-	21,25,25	0.68	0	23,38,38	0.78	1 (4%)
5	PPV	A	505	4	6,8,8	0.59	0	12,13,13	0.85	0
3	AMP	A	502	-	21,25,25	0.73	0	23,38,38	0.87	1 (4%)
2	HSX	C	501	-	14,14,14	0.48	0	19,21,21	0.54	0
2	HSX	A	501	-	14,14,14	0.47	0	19,21,21	0.54	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	HSX	D	501	-	-	1/6/22/22	0/1/1/1
3	AMP	B	503	-	-	0/6/26/26	0/3/3/3
2	HSX	B	501	-	-	0/6/22/22	0/1/1/1
3	AMP	B	502	-	-	0/6/26/26	0/3/3/3
3	AMP	A	503	-	-	0/6/26/26	0/3/3/3
5	PPV	A	505	4	-	0/6/6/6	-
3	AMP	A	502	-	-	2/6/26/26	0/3/3/3
2	HSX	C	501	-	-	0/6/22/22	0/1/1/1
2	HSX	A	501	-	-	0/6/22/22	0/1/1/1

There are no bond length outliers.

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	A	503	AMP	C5-C6-N6	2.25	123.75	120.31
3	B	503	AMP	C5-C6-N6	2.20	123.66	120.31
3	B	502	AMP	C5-C6-N6	2.17	123.61	120.31

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	A	502	AMP	C5-C6-N6	2.08	123.48	120.31

There are no chirality outliers.

All (3) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	502	AMP	O4'-C4'-C5'-O5'
3	A	502	AMP	C3'-C4'-C5'-O5'
2	D	501	HSX	O4-C4-C5-O5

There are no ring outliers.

2 monomers are involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	B	503	AMP	1	0
3	B	502	AMP	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 HSX D 501

Bond lengths

Bond angles

Torsions

Rings

Ligand AMP B 503

Bond lengths

Bond angles

Torsions

Rings

Ligand HSX B 501

Bond lengths

Bond angles

Torsions

Rings

Ligand AMP B 502

Bond lengths

Bond angles

Torsions

Rings

Ligand AMP A 503

Bond lengths

Bond angles

Torsions

Rings

Ligand AMP A 502

Bond lengths

Bond angles

Torsions

Rings

Ligand HSX C 501

Bond lengths

Bond angles

Torsions

Rings

Ligand HSX A 501

Bond lengths

Bond angles

Torsions

Rings

5.7 Other polymers ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

There are no chain breaks in this entry.

6 Fit of model and data ⓘ

6.1 Protein, DNA and RNA chains ⓘ

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

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2			OWAB(Å^2)	Q<0.9
1	A	418/434 (96%)	-0.17	7 (1%)	69	67	52, 78, 144, 194	1 (0%)
1	B	423/434 (97%)	-0.17	0	100	100	54, 89, 125, 160	0
1	C	420/434 (96%)	-0.22	3 (0%)	84	82	54, 83, 125, 163	0
1	D	417/434 (96%)	-0.06	7 (1%)	69	67	58, 96, 148, 193	0
All	All	1678/1736 (96%)	-0.16	17 (1%)	79	77	52, 86, 139, 194	1 (0%)

All (17) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	355	PHE	4.1
1	C	361	PRO	3.2
1	A	324[A]	ARG	2.9
1	D	358	LEU	2.8
1	D	340	ALA	2.5
1	D	264	ASN	2.4
1	D	357	ASP	2.4
1	A	45	PHE	2.3
1	A	54	ASP	2.3
1	D	55	VAL	2.2
1	A	5	ALA	2.2
1	A	55	VAL	2.2
1	C	365	ARG	2.2
1	A	90	PRO	2.1
1	A	96	VAL	2.1
1	D	130	ASN	2.1
1	C	360	ASP	2.0

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 (i)

There are no monosaccharides in this entry.

6.4 Ligands (i)

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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
3	AMP	A	503	23/23	0.77	0.11	70,95,106,117	0
3	AMP	B	502	23/23	0.78	0.10	84,98,110,119	0
5	PPV	A	505	9/9	0.84	0.09	99,109,120,125	0
3	AMP	B	503	23/23	0.86	0.10	76,91,103,107	0
3	AMP	A	502	23/23	0.86	0.09	62,77,89,106	0
4	MG	A	504	1/1	0.87	0.13	99,99,99,99	0
2	HSX	D	501	14/14	0.93	0.09	62,77,85,96	0
2	HSX	A	501	14/14	0.95	0.07	59,72,76,79	0
2	HSX	B	501	14/14	0.96	0.07	65,72,80,81	0
2	HSX	C	501	14/14	0.97	0.05	53,61,67,67	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 AMP A 503:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative)
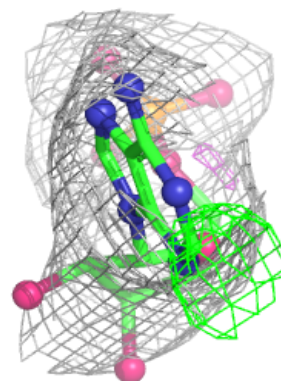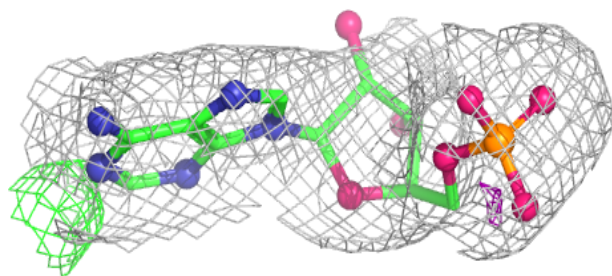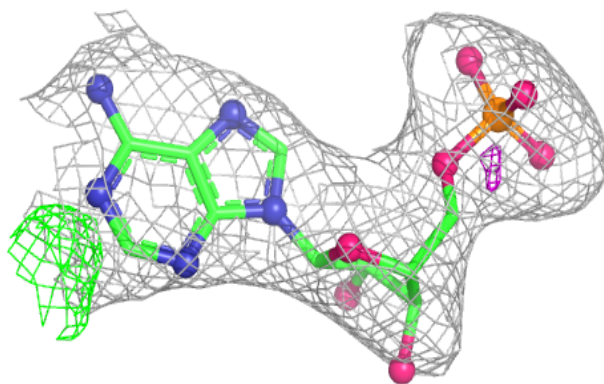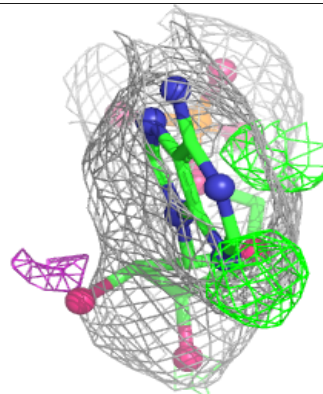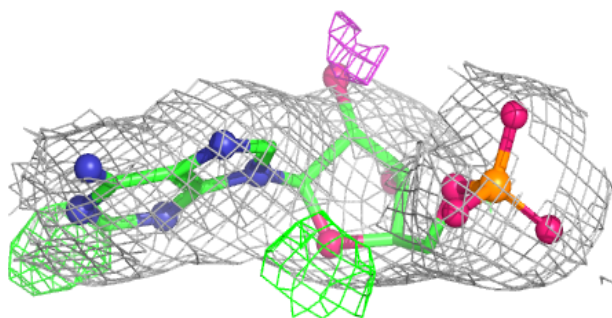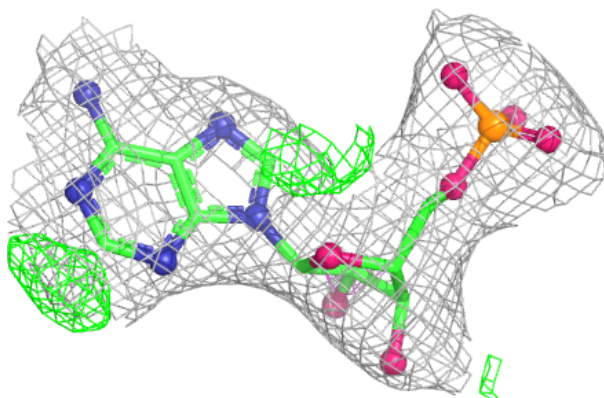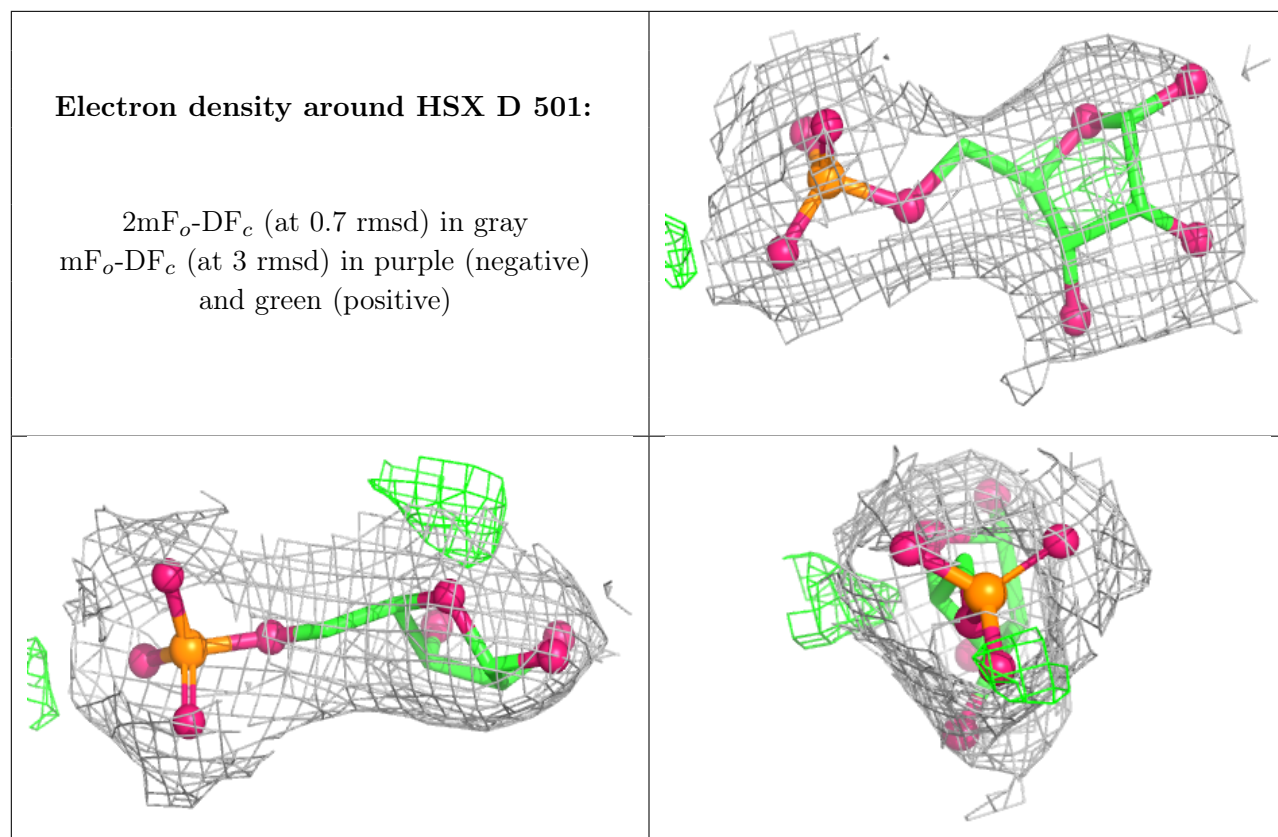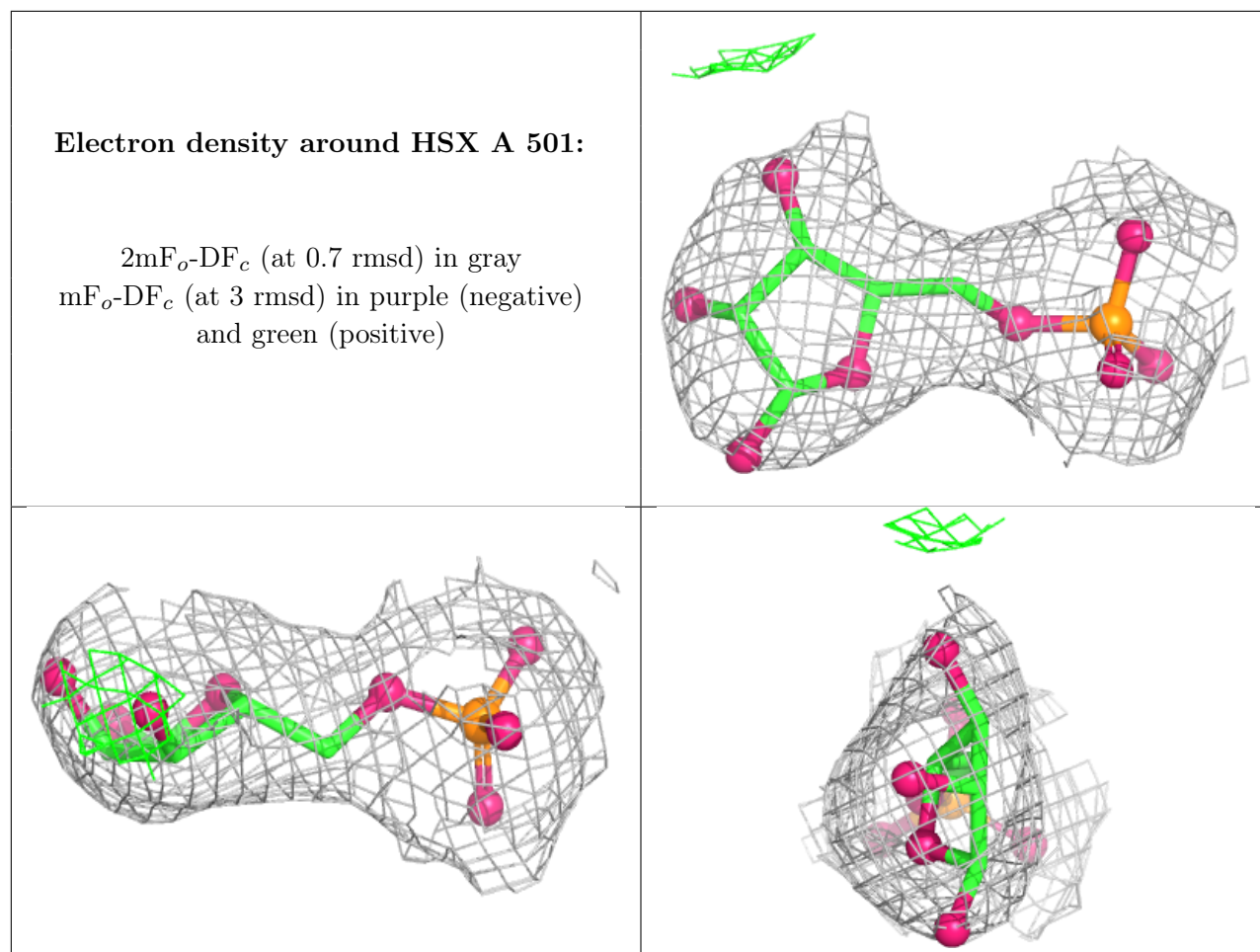and green (positive)
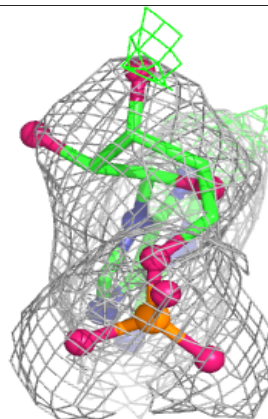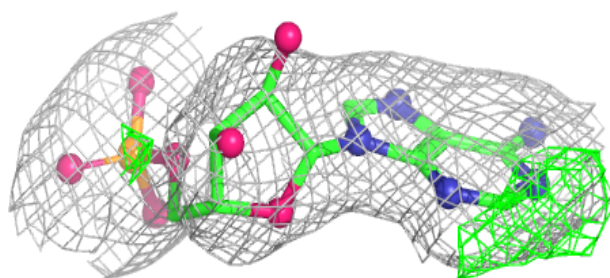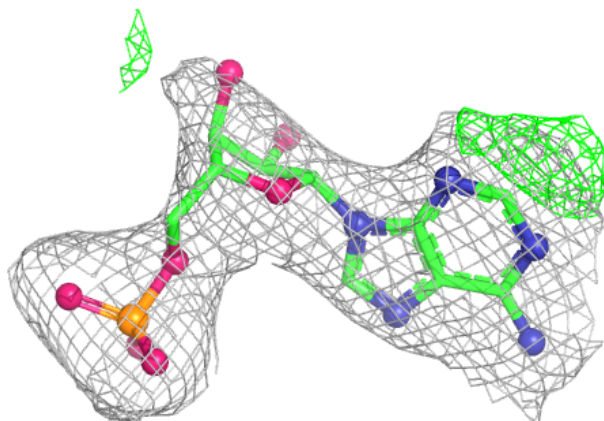
Electron density around AMP B 502:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative)
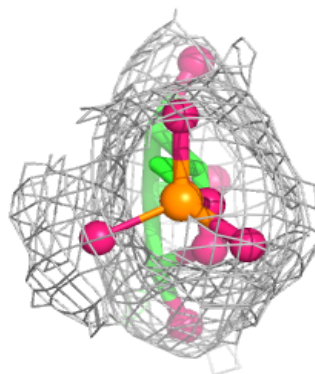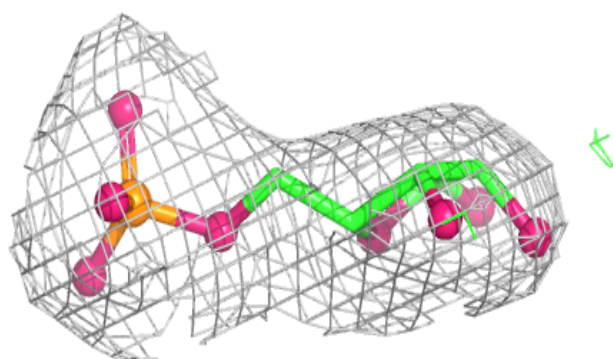and green (positive)
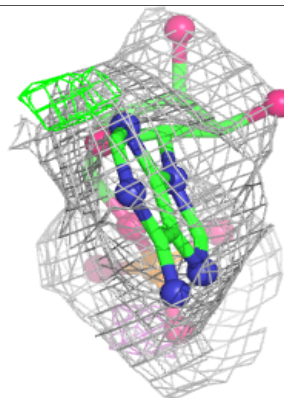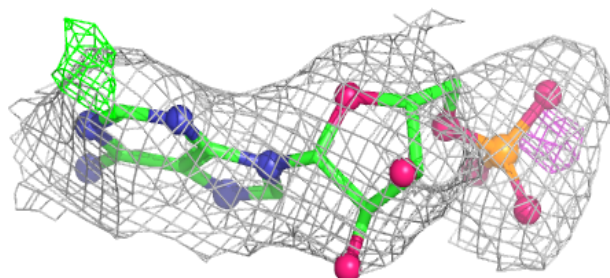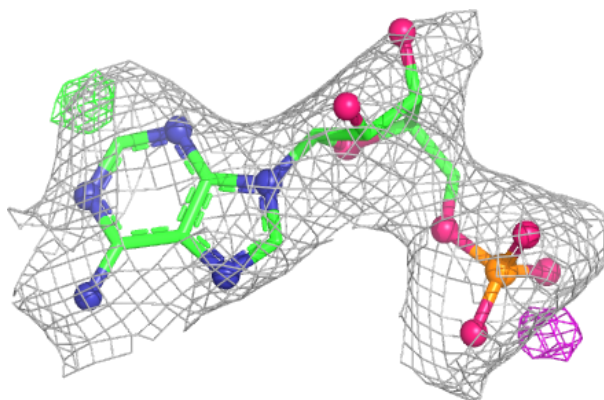
Electron density around AMP B 503:

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

Electron density around AMP A 502:

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

Electron density around HSX D 501:

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

Electron density around HSX A 501:

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

Electron density around HSX B 501:

2mF$_o$-DF$_c$ (at 0.7 rmsd) in gray
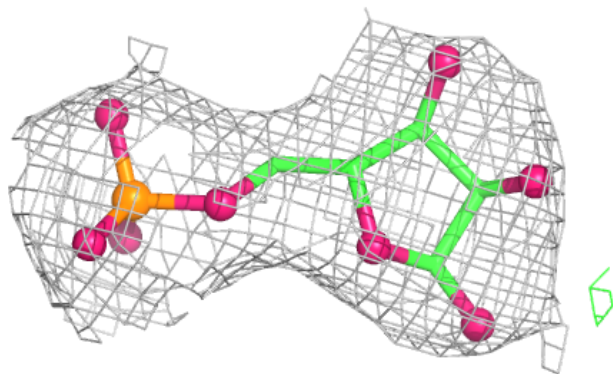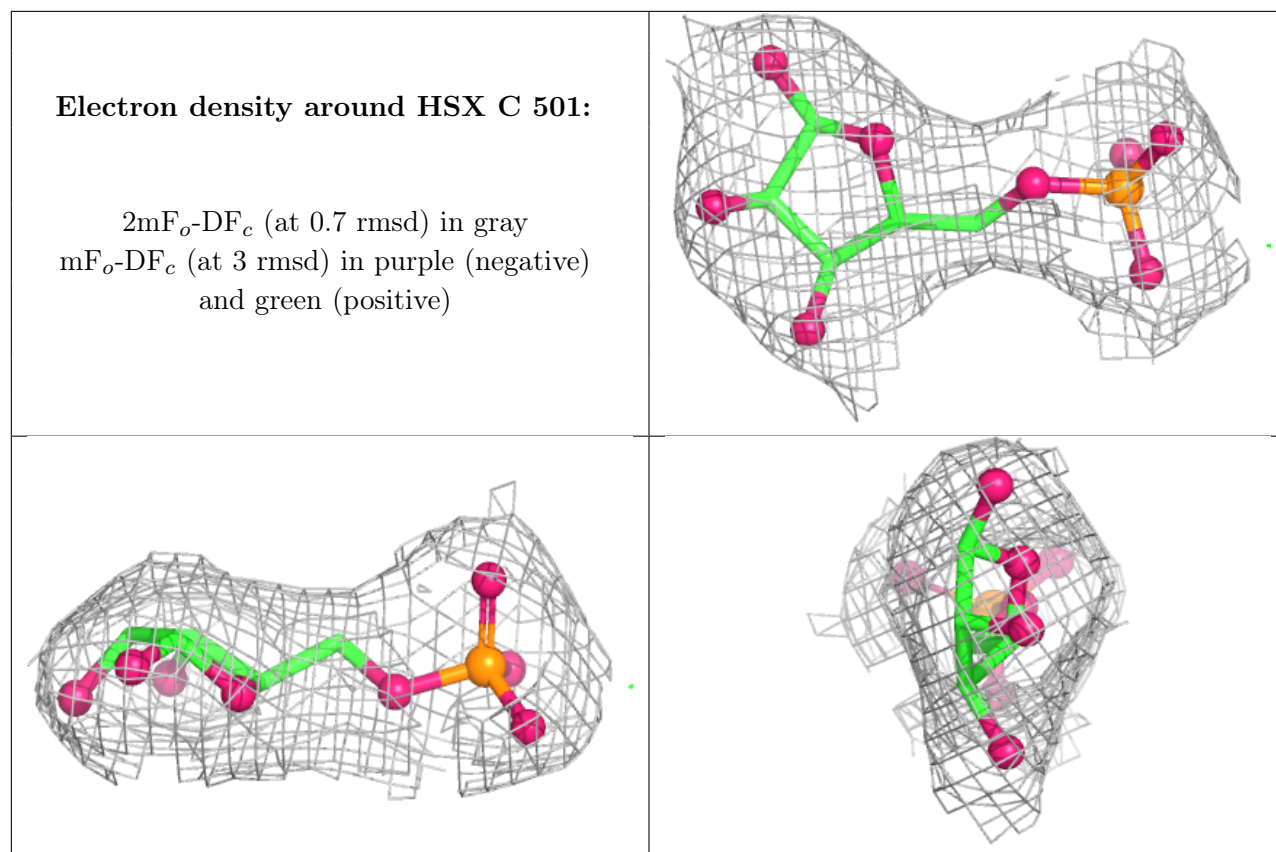mF$_o$-DF$_c$ (at 3 rmsd) in purple (negative)
and green (positive)

Electron density around HSX 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)

6.5 Other polymers ⓘ

There are no such residues in this entry.