Full wwPDB X-ray Structure Validation Report ⓘ

Jun 12, 2024 – 08:05 PM EDT

PDB ID	:	4A7X
Title	:	Crystal structure of uridylate kinase from Helicobacter pylori
Authors	:	Chu, C.H.; Liu, M.H.; Chen, P.C.; Sun, Y.J.
Deposited on	:	2011-11-15
Resolution	:	2.49 Å(reported)

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

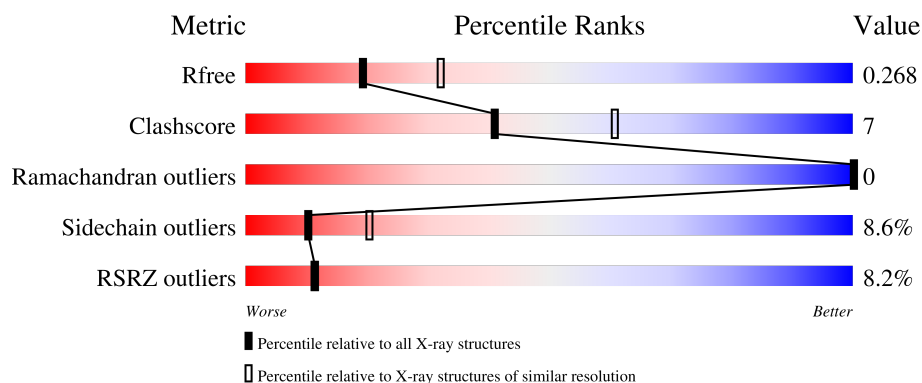|		
MolProbity	:	4.02b-467
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	1.20.1
EDS	:	2.36.2
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.36.2

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 2.49 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		0.268
Clashscore		7
Ramachandran outliers		0
Sidechain outliers		8.6%
RSRZ outliers		8.2%

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}	130704	4661 (2.50-2.50)
Clashscore	141614	5346 (2.50-2.50)
Ramachandran outliers	138981	5231 (2.50-2.50)
Sidechain outliers	138945	5233 (2.50-2.50)
RSRZ outliers	127900	4559 (2.50-2.50)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for >=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	240	15% ... 82% ... 13% ..
1	B	240	4% ... 77% ... 16% . 5%
1	C	240	6% ... 78% ... 18% ..
1	D	240	4% ... 77% ... 15% . 5%
1	E	240	7% ... 76% ... 14% . 5%

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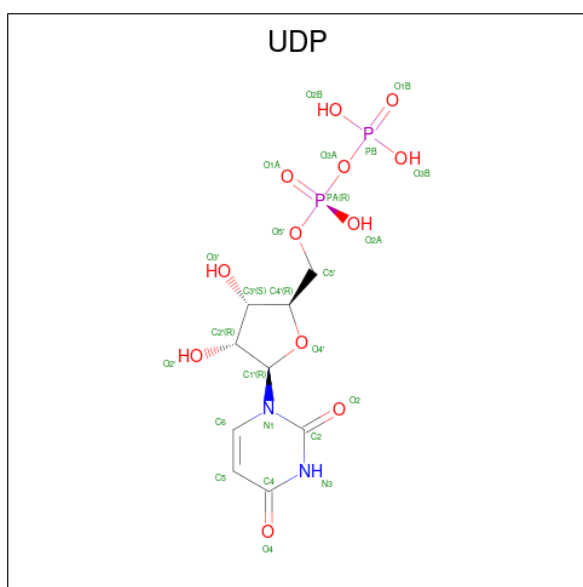| Mol	Chain	Length	Quality of chain
1	F	240	

2 Entry composition ⓘ

There are 3 unique types of molecules in this entry. The entry contains 10957 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 URIDYLATE KINASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	234	Total	C	N	O	S	0	0	0
			1763	1115	305	335	8			
1	B	228	Total	C	N	O	S	0	0	0
			1727	1092	298	329	8			
1	C	234	Total	C	N	O	S	0	0	0
			1783	1129	308	338	8			
1	D	228	Total	C	N	O	S	0	0	0
			1727	1092	298	329	8			
1	E	227	Total	C	N	O	S	0	0	0
			1726	1092	298	328	8			
1	F	230	Total	C	N	O	S	0	0	0
			1738	1100	301	329	8			

- Molecule 2 is URIDINE-5'-DIPHOSPHATE (three-letter code: UDP) (formula: $C_9H_{14}N_2O_{12}P_2$).

UDP

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	B	1	Total 25	C 9	N 2	O 12	P 2	0	0
2	C	1	Total 25	C 9	N 2	O 12	P 2	0	0
2	D	1	Total 25	C 9	N 2	O 12	P 2	0	0
2	E	1	Total 25	C 9	N 2	O 12	P 2	0	0

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	59	Total 59	O 59	0	0
3	B	74	Total 74	O 74	0	0
3	C	89	Total 89	O 89	0	0
3	D	76	Total 76	O 76	0	0
3	E	34	Total 34	O 34	0	0
3	F	61	Total 61	O 61	0	0

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

3 Residue-property plots ⓘ

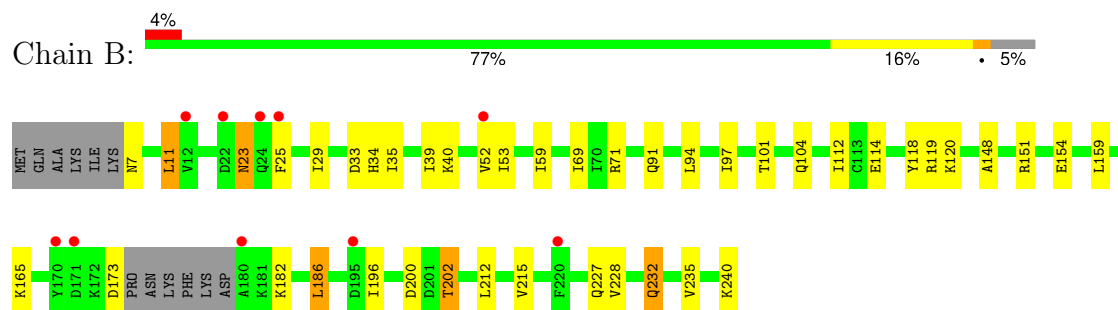These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. 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.
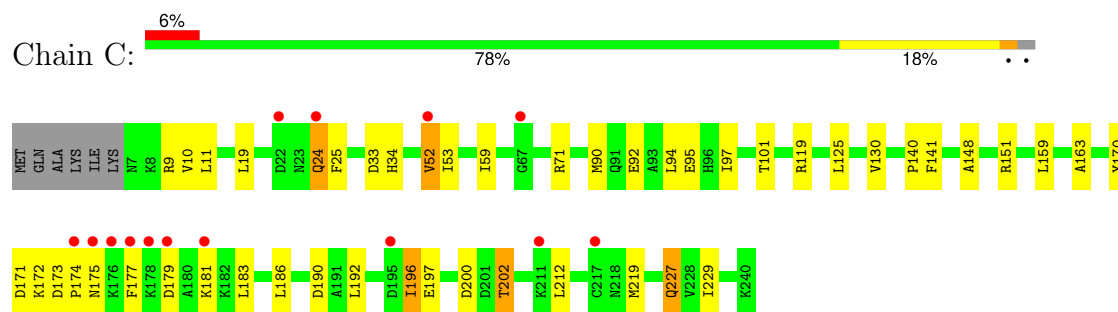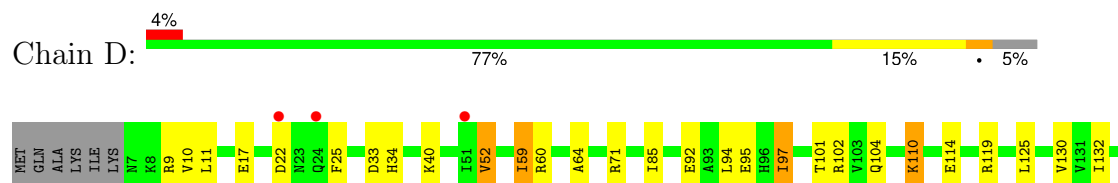
- Molecule 1: URIDYLATE KINASE

Chain A:

- Molecule 1: URIDYLATE KINASE

Chain B:

- Molecule 1: URIDYLATE KINASE

Chain C:

- Molecule 1: URIDYLATE KINASE

Chain D:

R151 L159 I160 I161 K165 Y170 D173 PRO ASN LYS PHE LYS ASP A180 K181 K182 L192 I193 G194 D195 I196 E197 T202 K211 L212 F220 L225 L226 Q227 V228 I229 K240

• Molecule 1: URIDYLATE KINASE

Chain E:

7%

76%   14%   •   5%

MET GLN ALA LYS ILE LYS N7 K8 R9 V10 L11 V12 K13 F14 E17 D22 N23 Q24 F25 K40 V52 I53 G54 G55 G56 N57 I58 I59 S63 Q66 R71 N86 E92 A93 L94 I97 T101 Y118 R119 V130 T144 R151 E154

L159 T164 K165 V166 Y170 D171 K172 D173 PRO ASN LYS PHE LYS ASP ALA K181 K182 L183 D184 T185 L186 S187 Y188 N189 I193 G194 D195 I196 T202 M219 F220 I229 V235 K240

• Molecule 1: URIDYLATE KINASE

Chain F:

11%

81%   12%   • •

MET GLN ALA LYS ILE LYS N7 V10 L11 V12 K13 F14 D22 N23 Q24 K40 I51 V52 I53 R60 G61 V62 S63 A64 A65 Q66 G67 G68 I69 I70 R71 R72 T73 D76 Y77 M80 A87 M90 Q91 E92 A93 L94 E95 H96 I97 G98 L99 D100 T101 K110

R119 V130 F141 L159 D173 PRO ASN LYS PHE K178 D179 A180 L183 L186 D195 I196 E197 V198 D201 L206 L212 M219 F220 K221 N224 Q227 K240

4 Data and refinement statistics (i)

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α, β, γ	147.14Å 127.63Å 93.18Å 90.00° 91.46° 90.00°	Depositor
Resolution (Å)	96.40 – 2.49 26.66 – 2.49	Depositor EDS
% Data completeness (in resolution range)	98.9 (96.40-2.49) 99.0 (26.66-2.49)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	2.93 (at 2.50Å)	Xtriage
Refinement program	REFMAC 5.5.0109	Depositor
R, R_{free}	0.213 , 0.276 0.209 , 0.268	Depositor DCC
R_{free} test set	2994 reflections (5.04%)	wwPDB-VP
Wilson B-factor (Å^2)	44.7	Xtriage
Anisotropy	0.211	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.35 , 45.6	EDS
L-test for twinning[2]	$< |L| > = 0.53$, $< L^2 > = 0.37$	Xtriage
Estimated twinning fraction	0.000 for -h,-k,l	Xtriage
F_o,F_c correlation	0.95	EDS
Total number of atoms	10957	wwPDB-VP
Average B, all atoms (Å^2)	51.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 45.15 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 1.3776e-04. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

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[1]Intensities estimated from amplitudes.
[2]Theoretical values of $< |L| >$, $< L^2 >$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality ⓘ

5.1 Standard geometry ⓘ

Bond lengths and bond angles in the following residue types are not validated in this section:
UDP

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	0.41	0/1782	0.58	0/2402
1	B	0.42	0/1744	0.55	0/2348
1	C	0.55	0/1803	0.62	0/2427
1	D	0.50	0/1744	0.61	0/2348
1	E	0.41	0/1743	0.57	1/2345 (0.0%)
1	F	0.50	0/1755	0.62	1/2362 (0.0%)
All	All	0.47	0/10571	0.59	2/14232 (0.0%)

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	F	159	LEU	CA-CB-CG	5.54	128.05	115.30
1	E	159	LEU	CA-CB-CG	5.32	127.53	115.30

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts ⓘ

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

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	1763	0	1803	17	0
1	B	1727	0	1774	23	0
1	C	1783	0	1838	38	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	D	1727	0	1774	34	0
1	E	1726	0	1780	29	0
1	F	1738	0	1787	25	0
2	B	25	0	11	0	0
2	C	25	0	11	1	0
2	D	25	0	11	1	0
2	E	25	0	11	4	0
3	A	59	0	0	3	0
3	B	74	0	0	6	0
3	C	89	0	0	6	0
3	D	76	0	0	4	0
3	E	34	0	0	1	0
3	F	61	0	0	2	0
All	All	10957	0	10800	152	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 7.

All (152) 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:E:57:ASN:HD21	1:E:86:ASN:HD21	1.07	0.93
1:D:227:GLN:HE21	1:D:227:GLN:HA	1.37	0.89
1:A:101:THR:HB	3:A:2029:HOH:O	1.71	0.88
1:E:57:ASN:H	1:E:57:ASN:HD22	1.25	0.84
1:C:11:LEU:HD21	1:C:52:VAL:HG13	1.61	0.82
1:C:172:LYS:O	1:C:174:PRO:HD3	1.79	0.82
1:E:11:LEU:HD21	1:E:52:VAL:HG13	1.61	0.81
1:D:11:LEU:HD21	1:D:52:VAL:HG13	1.63	0.80
1:C:171:ASP:HA	1:C:196:ILE:HG21	1.64	0.80
1:D:10:VAL:HG11	1:D:229:ILE:HG12	1.64	0.79
1:D:59:ILE:HD11	1:D:64:ALA:HB2	1.68	0.74
1:E:40:LYS:HD2	1:E:97:ILE:HG23	1.73	0.70
1:C:59:ILE:CD1	1:D:85:ILE:HG21	2.24	0.68
1:C:11:LEU:HD21	1:C:52:VAL:CG1	2.24	0.68
1:E:118:TYR:HE1	1:E:154:GLU:O	1.78	0.67
1:D:165:LYS:HD3	1:D:165:LYS:H	1.59	0.67
1:F:10:VAL:HG12	1:F:159:LEU:CD1	2.25	0.67
1:F:63:SER:HA	1:F:66:GLN:HE21	1.60	0.67
1:A:11:LEU:HD21	1:A:52:VAL:HG13	1.77	0.67
2:E:1241:UDP:H3'	2:E:1241:UDP:O2A	1.96	0.66

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:F:221:LYS:HB2	1:F:224:ASN:HB2	1.76	0.65
2:D:1241:UDP:PA	2:D:1241:UDP:H3'	2.36	0.64
1:C:95:GLU:OE1	1:E:119:ARG:NH2	2.30	0.64
1:C:186:LEU:HD22	1:C:190:ASP:HB3	1.81	0.63
1:B:151:ARG:NH2	3:B:2052:HOH:O	2.30	0.63
1:E:101:THR:HG22	1:E:130:VAL:HB	1.81	0.63
1:D:40:LYS:HD2	1:D:97:ILE:HG23	1.82	0.62
1:D:119:ARG:HG3	3:D:2047:HOH:O	1.99	0.62
1:A:7:ASN:N	3:A:2001:HOH:O	2.34	0.61
1:C:59:ILE:HD11	1:D:85:ILE:HG21	1.82	0.61
1:B:196:ILE:O	1:B:196:ILE:HG13	2.01	0.60
2:C:1241:UDP:O3B	2:C:1241:UDP:O1A	2.18	0.60
1:F:40:LYS:HG3	1:F:99:LEU:HD21	1.84	0.59
1:F:40:LYS:HD2	1:F:97:ILE:HG23	1.84	0.59
1:C:95:GLU:CD	1:E:119:ARG:HH22	2.07	0.59
1:C:170:TYR:CG	1:C:174:PRO:HG3	2.38	0.58
1:F:10:VAL:HG12	1:F:159:LEU:HD13	1.85	0.58
1:D:104:GLN:HG2	1:D:114:GLU:HG3	1.85	0.57
1:C:19:LEU:HD11	1:C:53:ILE:HD11	1.86	0.57
1:C:227:GLN:HE21	1:C:227:GLN:HA	1.68	0.57
1:B:186:LEU:HD21	1:B:196:ILE:HD11	1.87	0.57
1:E:57:ASN:HD22	1:E:57:ASN:N	1.99	0.57
1:C:140:PRO:O	1:C:141:PHE:HB2	2.04	0.57
1:C:183:LEU:HD13	1:C:186:LEU:HD21	1.85	0.57
1:E:58:ILE:HG22	1:E:59:ILE:HG23	1.87	0.57
1:B:104:GLN:HG2	1:B:114:GLU:HG3	1.86	0.57
1:F:14:PHE:HE1	1:F:219:MET:HE1	1.70	0.56
1:B:23:ASN:HB2	3:B:2009:HOH:O	2.05	0.56
1:F:101:THR:HG22	1:F:130:VAL:HB	1.87	0.56
1:B:7:ASN:N	3:B:2001:HOH:O	2.39	0.56
1:C:151:ARG:NH1	3:C:2067:HOH:O	2.39	0.56
1:C:163:ALA:HB1	1:C:219:MET:HB3	1.88	0.55
1:D:227:GLN:HA	1:D:227:GLN:NE2	2.16	0.55
1:F:196:ILE:HG23	1:F:198:VAL:HG23	1.87	0.55
1:D:17:GLU:OE2	1:D:60:ARG:NH1	2.40	0.54
1:F:91:GLN:O	1:F:95:GLU:HG3	2.07	0.54
1:A:118:TYR:HB3	1:A:119:ARG:NH2	2.22	0.54
1:E:55:GLY:H	2:E:1241:UDP:PA	2.30	0.54
1:B:215:VAL:HG11	1:B:228:VAL:HG11	1.90	0.53
1:C:177:PHE:C	1:C:179:ASP:H	2.12	0.53
1:C:10:VAL:HG11	1:C:229:ILE:HG12	1.90	0.53

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:D:2056:HOH:O	1:E:151:ARG:NH2	2.41	0.53
1:A:63:SER:O	1:A:66:GLN:HG2	2.10	0.52
1:C:52:VAL:HG11	1:C:148:ALA:HA	1.90	0.52
1:B:40:LYS:HD2	1:B:97:ILE:HD12	1.90	0.52
1:D:101:THR:HG22	1:D:130:VAL:HB	1.92	0.52
1:A:94:LEU:HB3	1:A:101:THR:HG21	1.91	0.52
1:D:193:ILE:O	1:D:193:ILE:HG22	2.10	0.51
1:E:240:LYS:HE2	3:E:2034:HOH:O	2.10	0.51
1:C:173:ASP:OD1	1:C:175:ASN:N	2.29	0.50
1:E:57:ASN:ND2	1:E:86:ASN:HD21	1.91	0.50
1:E:71:ARG:HD3	1:F:92:GLU:OE1	2.11	0.50
1:C:171:ASP:HA	1:C:196:ILE:CG2	2.39	0.50
1:E:57:ASN:H	1:E:57:ASN:ND2	2.02	0.49
1:A:95:GLU:OE1	1:C:119:ARG:NH2	2.46	0.49
1:E:187:SER:HA	1:E:240:LYS:HD2	1.94	0.49
1:F:14:PHE:HE1	1:F:219:MET:CE	2.24	0.49
1:C:71:ARG:HD3	1:D:92:GLU:OE1	2.12	0.49
1:C:170:TYR:CD2	1:C:174:PRO:HG3	2.47	0.49
1:D:193:ILE:O	1:D:193:ILE:CG2	2.58	0.48
1:A:189:ASN:O	1:A:193:ILE:HG12	2.13	0.48
1:B:119:ARG:NH2	1:D:95:GLU:OE1	2.46	0.48
1:A:92:GLU:OE1	1:B:71:ARG:HD3	2.13	0.48
1:C:179:ASP:HB2	3:C:2075:HOH:O	2.13	0.48
1:A:40:LYS:O	1:A:44:GLU:HG3	2.14	0.48
1:F:60:ARG:HB2	1:F:63:SER:HB2	1.96	0.48
1:A:221:LYS:HB3	1:A:224:ASN:HB2	1.96	0.48
1:E:54:GLY:HA2	2:E:1241:UDP:O1A	2.14	0.48
1:B:91:GLN:HG3	1:B:101:THR:OG1	2.14	0.47
1:F:183:LEU:HD13	1:F:186:LEU:HD21	1.95	0.47
1:A:29:ILE:HG23	1:B:69:ILE:HG13	1.96	0.47
1:B:119:ARG:HH22	1:D:95:GLU:CD	2.17	0.47
1:B:227:GLN:NE2	3:B:2070:HOH:O	2.39	0.47
1:F:227:GLN:NE2	3:F:2060:HOH:O	2.42	0.47
1:D:165:LYS:H	1:D:165:LYS:CD	2.25	0.47
1:E:92:GLU:HG3	1:F:70:ILE:HG23	1.96	0.47
1:C:25:PHE:HB3	1:D:25:PHE:CE2	2.50	0.47
1:A:91:GLN:O	1:A:95:GLU:HG3	2.15	0.47
1:C:34:HIS:HB3	3:C:2008:HOH:O	2.13	0.47
1:E:17:GLU:H	1:E:17:GLU:CD	2.18	0.47
1:D:159:LEU:CD2	1:D:161:ILE:HG13	2.44	0.47
1:B:34:HIS:HB2	3:B:2011:HOH:O	2.15	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:A:2038:HOH:O	1:C:119:ARG:HG3	2.15	0.46
1:A:69:ILE:HD13	1:B:33:ASP:OD1	2.15	0.46
1:A:25:PHE:CE1	1:B:25:PHE:HB2	2.51	0.46
1:B:11:LEU:HD21	1:B:52:VAL:HG23	1.97	0.46
1:B:118:TYR:HE1	1:B:154:GLU:O	1.97	0.46
1:F:119:ARG:HG2	3:F:2035:HOH:O	2.14	0.46
1:D:34:HIS:HB3	3:D:2021:HOH:O	2.15	0.46
3:C:2045:HOH:O	1:D:110:LYS:HG3	2.15	0.46
1:F:60:ARG:CB	1:F:63:SER:HB2	2.46	0.45
1:C:92:GLU:OE1	1:D:71:ARG:HD3	2.16	0.45
1:F:94:LEU:HB3	1:F:101:THR:HG21	1.99	0.45
1:C:177:PHE:HB3	3:C:2075:HOH:O	2.16	0.45
1:F:14:PHE:CE1	1:F:219:MET:HE1	2.52	0.45
1:F:91:GLN:HG3	1:F:101:THR:OG1	2.16	0.45
1:C:101:THR:HG22	1:C:130:VAL:HB	1.99	0.45
1:D:227:GLN:HE21	1:D:227:GLN:CA	2.13	0.45
1:B:200:ASP:OD2	1:B:202:THR:HG23	2.17	0.45
1:E:172:LYS:O	1:E:173:ASP:C	2.55	0.44
1:C:59:ILE:CD1	1:D:85:ILE:CG2	2.94	0.44
1:E:10:VAL:HG11	1:E:229:ILE:HG12	1.98	0.44
1:B:52:VAL:HG21	1:B:148:ALA:HA	1.99	0.44
1:D:9:ARG:HD3	1:D:125:LEU:HD13	1.99	0.44
1:B:232:GLN:HE21	1:B:232:GLN:HB2	1.64	0.43
1:C:24:GLN:N	3:C:2010:HOH:O	2.46	0.43
1:C:200:ASP:OD2	1:C:202:THR:HG23	2.18	0.43
1:F:196:ILE:O	1:F:196:ILE:CG2	2.65	0.43
1:E:53:ILE:HD13	1:E:54:GLY:N	2.33	0.43
1:D:94:LEU:HD22	1:D:132:ILE:HD11	2.00	0.43
1:E:219:MET:HE2	1:E:220:PHE:CZ	2.54	0.43
1:B:35:ILE:O	1:B:39:ILE:HG12	2.19	0.43
1:A:107:ILE:HD12	1:A:135:ALA:HB1	2.00	0.43
1:F:90:MET:HG3	1:F:94:LEU:HD22	2.01	0.43
1:E:57:ASN:N	1:E:57:ASN:ND2	2.66	0.42
1:C:196:ILE:O	1:C:196:ILE:HG12	2.19	0.42
1:F:219:MET:HE3	1:F:219:MET:HB3	1.89	0.42
1:D:165:LYS:HD3	1:D:165:LYS:N	2.30	0.42
1:E:144:THR:HG1	2:E:1241:UDP:PA	2.42	0.42
1:D:151:ARG:NH2	3:D:2058:HOH:O	2.51	0.42
1:D:97:ILE:HG23	1:D:97:ILE:O	2.20	0.42
1:C:140:PRO:O	1:C:141:PHE:CB	2.67	0.42
1:E:164:THR:HB	1:E:165:LYS:H	1.74	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:90:MET:HG3	1:A:94:LEU:HD22	2.02	0.42
1:D:160:ILE:HG22	1:D:212:LEU:CD1	2.50	0.42
1:F:77:TYR:HA	1:F:80:MET:HE3	2.01	0.41
1:D:10:VAL:HG12	1:D:159:LEU:HD13	2.03	0.41
1:C:9:ARG:HD3	1:C:125:LEU:HD13	2.02	0.41
1:E:183:LEU:HD23	1:E:186:LEU:HD11	2.03	0.41
3:B:2046:HOH:O	1:D:102:ARG:NH2	2.54	0.41
1:C:227:GLN:HA	1:C:227:GLN:NE2	2.35	0.41
1:E:10:VAL:HG12	1:E:159:LEU:HD22	2.03	0.41

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	232/240 (97%)	227 (98%)	5 (2%)	0	100	100
1	B	224/240 (93%)	216 (96%)	8 (4%)	0	100	100
1	C	232/240 (97%)	225 (97%)	7 (3%)	0	100	100
1	D	224/240 (93%)	219 (98%)	5 (2%)	0	100	100
1	E	223/240 (93%)	218 (98%)	5 (2%)	0	100	100
1	F	226/240 (94%)	215 (95%)	11 (5%)	0	100	100
All	All	1361/1440 (94%)	1320 (97%)	41 (3%)	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	186/197 (94%)	170 (91%)	16 (9%)	10	20
1	B	184/197 (93%)	166 (90%)	18 (10%)	8	15
1	C	191/197 (97%)	177 (93%)	14 (7%)	14	27
1	D	184/197 (93%)	169 (92%)	15 (8%)	11	22
1	E	185/197 (94%)	164 (89%)	21 (11%)	5	11
1	F	184/197 (93%)	172 (94%)	12 (6%)	17	33
All	All	1114/1182 (94%)	1018 (91%)	96 (9%)	10	20

All (96) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	22	ASP
1	A	24	GLN
1	A	29	ILE
1	A	72	ARG
1	A	94	LEU
1	A	119	ARG
1	A	150	LEU
1	A	185	THR
1	A	192	LEU
1	A	200	ASP
1	A	206	LEU
1	A	212	LEU
1	A	220	PHE
1	A	221	LYS
1	A	232	GLN
1	A	240	LYS
1	B	11	LEU
1	B	23	ASN
1	B	29	ILE
1	B	53	ILE
1	B	59	ILE
1	B	94	LEU
1	B	112	ILE
1	B	120	LYS
1	B	159	LEU
1	B	165	LYS
1	B	173	ASP

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Mol	Chain	Res	Type
1	B	182	LYS
1	B	186	LEU
1	B	202	THR
1	B	212	LEU
1	B	232	GLN
1	B	235	VAL
1	B	240	LYS
1	C	24	GLN
1	C	33	ASP
1	C	52	VAL
1	C	90	MET
1	C	94	LEU
1	C	97	ILE
1	C	159	LEU
1	C	181	LYS
1	C	192	LEU
1	C	196	ILE
1	C	197	GLU
1	C	202	THR
1	C	212	LEU
1	C	227	GLN
1	D	22	ASP
1	D	33	ASP
1	D	52	VAL
1	D	59	ILE
1	D	97	ILE
1	D	110	LYS
1	D	159	LEU
1	D	165	LYS
1	D	182	LYS
1	D	192	LEU
1	D	195	ASP
1	D	196	ILE
1	D	202	THR
1	D	225	LEU
1	D	227	GLN
1	E	7	ASN
1	E	8	LYS
1	E	11	LEU
1	E	23	ASN
1	E	52	VAL
1	E	53	ILE

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Mol	Chain	Res	Type
1	E	57	ASN
1	E	59	ILE
1	E	63	SER
1	E	66	GLN
1	E	94	LEU
1	E	97	ILE
1	E	119	ARG
1	E	159	LEU
1	E	164	THR
1	E	166	VAL
1	E	183	LEU
1	E	185	THR
1	E	202	THR
1	E	235	VAL
1	E	240	LYS
1	F	11	LEU
1	F	60	ARG
1	F	94	LEU
1	F	110	LYS
1	F	159	LEU
1	F	196	ILE
1	F	197	GLU
1	F	201	ASP
1	F	206	LEU
1	F	212	LEU
1	F	219	MET
1	F	240	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (13) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	24	GLN
1	B	23	ASN
1	B	139	ASN
1	B	232	GLN
1	C	23	ASN
1	C	227	GLN
1	C	233	GLN
1	D	227	GLN
1	E	30	HIS
1	E	57	ASN
1	E	233	GLN

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Mol	Chain	Res	Type
1	F	66	GLN
1	F	233	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 ⓘ

4 ligands are modelled in this entry.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#|Z| > 2$	Counts	RMSZ	$\#|Z| > 2$
2	UDP	E	1241	-	25,26,26	1.38	2 (8%)	38,40,40	1.61	6 (15%)
2	UDP	B	1241	-	25,26,26	0.96	1 (4%)	38,40,40	1.89	12 (31%)
2	UDP	C	1241	-	25,26,26	0.88	1 (4%)	38,40,40	1.56	5 (13%)
2	UDP	D	1241	-	25,26,26	0.93	1 (4%)	38,40,40	1.58	4 (10%)

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

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	UDP	E	1241	-	-	3/16/32/32	0/2/2/2
2	UDP	B	1241	-	-	3/16/32/32	0/2/2/2
2	UDP	C	1241	-	-	1/16/32/32	0/2/2/2
2	UDP	D	1241	-	-	5/16/32/32	0/2/2/2

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	E	1241	UDP	PA-O3A	5.02	1.64	1.59
2	D	1241	UDP	C6-C5	2.22	1.40	1.35
2	E	1241	UDP	C6-C5	2.18	1.40	1.35
2	B	1241	UDP	C6-C5	2.10	1.40	1.35
2	C	1241	UDP	C6-C5	2.08	1.39	1.35

All (27) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	E	1241	UDP	C4-N3-C2	-5.38	119.93	126.61
2	D	1241	UDP	C4-N3-C2	-5.20	120.15	126.61
2	B	1241	UDP	N3-C2-N1	5.17	121.62	114.89
2	C	1241	UDP	C4-N3-C2	-5.01	120.39	126.61
2	B	1241	UDP	C4-N3-C2	-4.97	120.44	126.61
2	E	1241	UDP	N3-C2-N1	4.80	121.14	114.89
2	D	1241	UDP	N3-C2-N1	4.45	120.69	114.89
2	C	1241	UDP	N3-C2-N1	4.21	120.37	114.89
2	B	1241	UDP	C6-N1-C2	-3.68	116.52	121.00
2	D	1241	UDP	C5-C4-N3	3.48	119.68	114.80
2	C	1241	UDP	C5-C4-N3	3.41	119.57	114.80
2	E	1241	UDP	C5-C4-N3	3.24	119.34	114.80
2	B	1241	UDP	C5-C4-N3	2.82	118.75	114.80
2	C	1241	UDP	O3A-PA-O1A	-2.74	102.48	110.70
2	B	1241	UDP	O2-C2-N3	-2.59	116.70	121.49
2	B	1241	UDP	O5'-C5'-C4'	2.59	117.80	108.99
2	B	1241	UDP	O4'-C1'-N1	2.52	114.06	108.36
2	D	1241	UDP	O4-C4-C5	-2.42	120.98	125.16
2	B	1241	UDP	C2'-C3'-C4'	2.41	107.27	102.61
2	E	1241	UDP	O3B-PB-O3A	2.30	112.36	104.64
2	B	1241	UDP	O4-C4-C5	-2.27	121.24	125.16
2	E	1241	UDP	O4-C4-C5	-2.25	121.28	125.16
2	E	1241	UDP	O2-C2-N1	-2.19	119.94	122.80
2	C	1241	UDP	O2-C2-N3	-2.16	117.51	121.49
2	B	1241	UDP	C1'-N1-C2	2.12	121.39	117.59

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	B	1241	UDP	C4'-O4'-C1'	2.09	114.08	109.47
2	B	1241	UDP	C3'-C2'-C1'	2.02	105.28	101.46

There are no chirality outliers.

All (12) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	D	1241	UDP	C5'-O5'-PA-O2A
2	E	1241	UDP	O4'-C4'-C5'-O5'
2	B	1241	UDP	C3'-C4'-C5'-O5'
2	B	1241	UDP	O4'-C4'-C5'-O5'
2	E	1241	UDP	C3'-C4'-C5'-O5'
2	E	1241	UDP	C4'-C5'-O5'-PA
2	D	1241	UDP	C5'-O5'-PA-O1A
2	D	1241	UDP	C5'-O5'-PA-O3A
2	B	1241	UDP	C4'-C5'-O5'-PA
2	D	1241	UDP	C4'-C5'-O5'-PA
2	C	1241	UDP	C4'-C5'-O5'-PA
2	D	1241	UDP	PA-O3A-PB-O2B

There are no ring outliers.

3 monomers are involved in 6 short contacts:

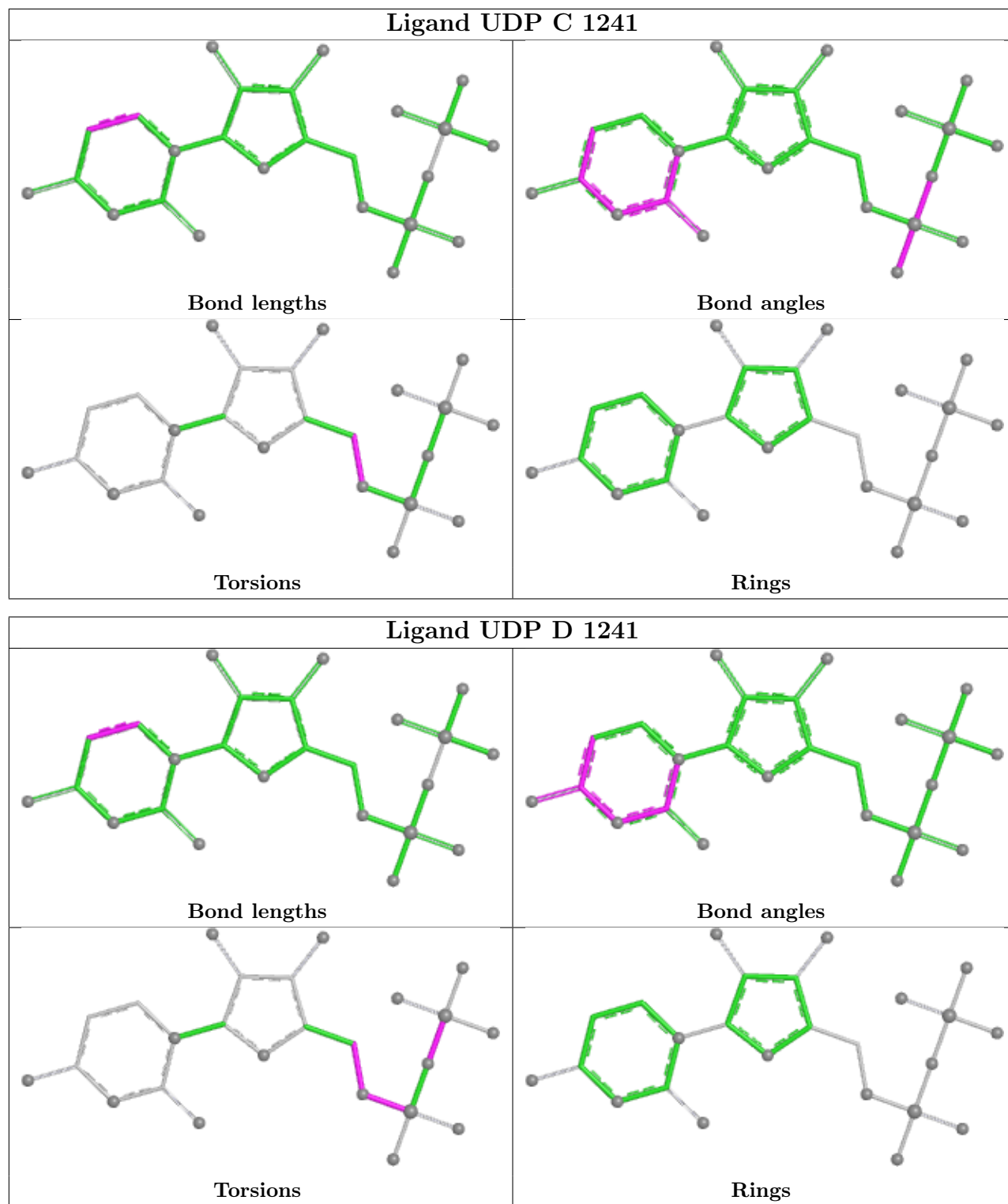| Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	E	1241	UDP	4	0
2	C	1241	UDP	1	0
2	D	1241	UDP	1	0

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 UDP E 1241

Bond lengths

Bond angles

Torsions

Rings

Ligand UDP B 1241

Bond lengths

Bond angles

Torsions

Rings

Ligand UDP C 1241

Bond lengths

Bond angles

Torsions

Rings

Ligand UDP D 1241

Bond lengths

Bond angles

Torsions

Rings
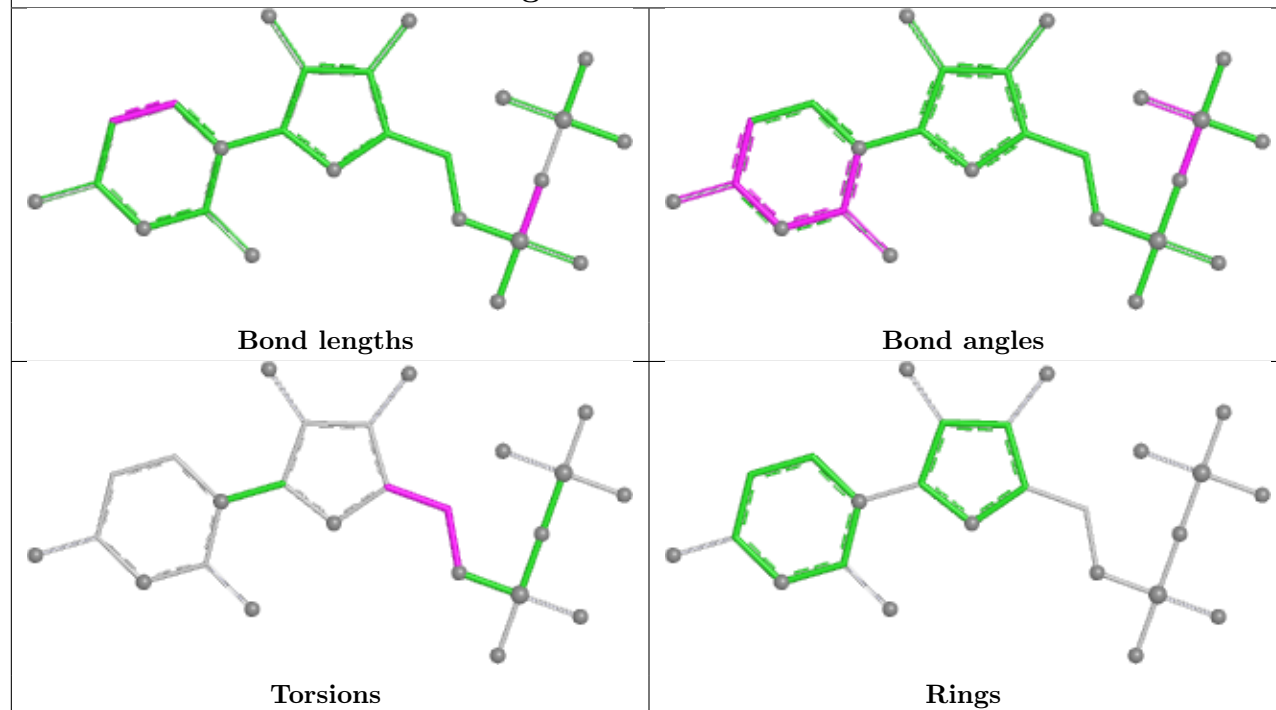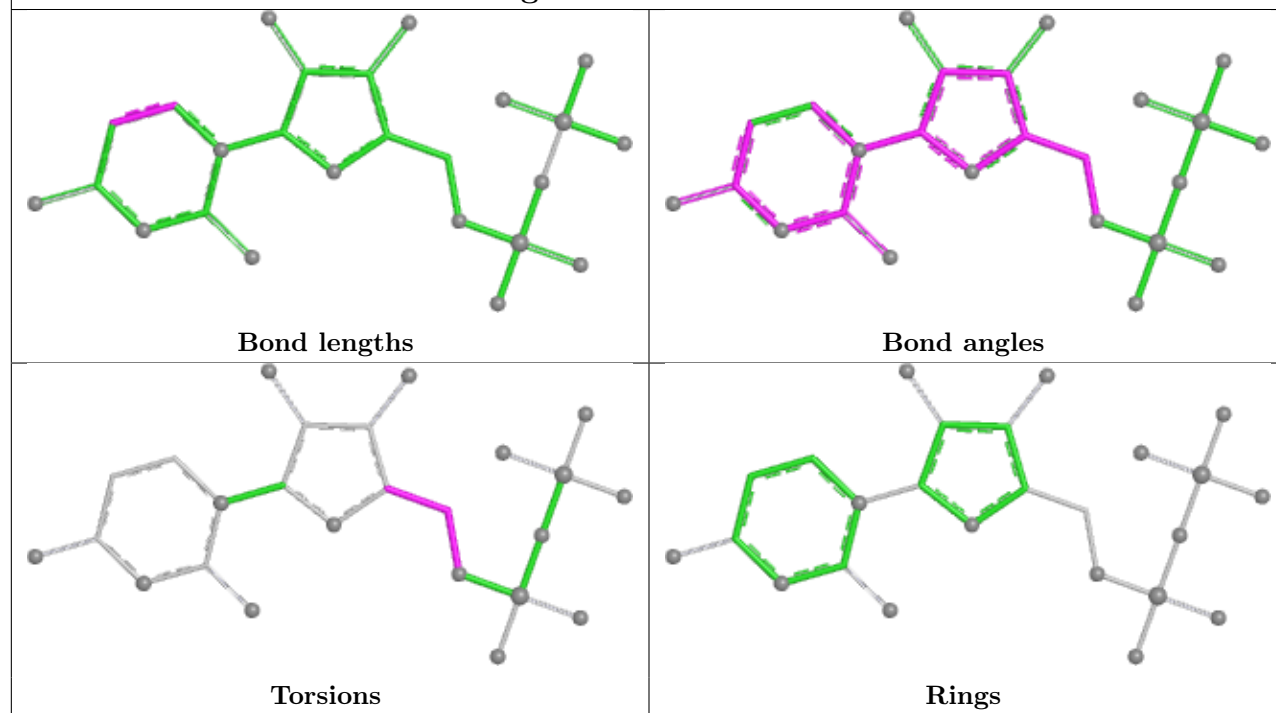
5.7   Other polymers ⓘ

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(Å²)	Q<0.9
1	A	234/240 (97%)	0.67	35 (14%)	2	2	32, 54, 86, 98	0
1	B	228/240 (95%)	0.19	10 (4%)	34	37	26, 51, 77, 94	0
1	C	234/240 (97%)	0.27	14 (5%)	21	22	23, 47, 71, 84	0
1	D	228/240 (95%)	0.08	10 (4%)	34	37	24, 45, 66, 73	0
1	E	227/240 (94%)	0.35	17 (7%)	14	14	25, 51, 74, 83	0
1	F	230/240 (95%)	0.53	27 (11%)	4	4	32, 53, 80, 97	0
All	All	1381/1440 (95%)	0.35	113 (8%)	11	11	23, 50, 77, 98	0

All (113) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	66	GLN	7.9
1	F	141	PHE	6.8
1	A	67	GLY	6.8
1	B	180	ALA	6.6
1	C	177	PHE	6.4
1	A	68	GLY	6.2
1	F	65	ALA	6.2
1	F	62	VAL	6.1
1	F	63	SER	6.1
1	A	65	ALA	5.9
1	A	63	SER	5.4
1	A	64	ALA	5.3
1	A	62	VAL	5.3
1	F	64	ALA	5.3
1	A	141	PHE	5.1
1	F	72	ARG	5.0
1	A	23	ASN	5.0
1	E	22	ASP	4.9
1	E	193	ILE	4.8

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Mol	Chain	Res	Type	RSRZ
1	A	61	GLY	4.8
1	B	22	ASP	4.8
1	A	220	PHE	4.8
1	F	66	GLN	4.7
1	A	22	ASP	4.7
1	F	68	GLY	4.7
1	E	171	ASP	4.6
1	E	195	ASP	4.6
1	F	67	GLY	4.5
1	A	60	ARG	4.5
1	A	72	ARG	4.5
1	C	175	ASN	4.4
1	E	170	TYR	4.3
1	E	194	GLY	4.2
1	C	22	ASP	4.2
1	B	195	ASP	4.0
1	E	23	ASN	3.9
1	A	173	ASP	3.9
1	E	196	ILE	3.8
1	F	22	ASP	3.8
1	F	61	GLY	3.7
1	E	12	VAL	3.7
1	A	175	ASN	3.6
1	B	25	PHE	3.5
1	C	176	LYS	3.5
1	A	174	PRO	3.3
1	C	178	LYS	3.2
1	C	174	PRO	3.0
1	A	177	PHE	3.0
1	A	11	LEU	2.9
1	D	22	ASP	2.9
1	C	181	LYS	2.9
1	D	24	GLN	2.9
1	E	25	PHE	2.9
1	B	170	TYR	2.8
1	D	220	PHE	2.8
1	A	195	ASP	2.8
1	C	195	ASP	2.8
1	B	171	ASP	2.8
1	E	173	ASP	2.8
1	C	211	LYS	2.8
1	A	21	GLY	2.7

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Mol	Chain	Res	Type	RSRZ
1	B	220	PHE	2.7
1	F	179	ASP	2.7
1	F	71	ARG	2.7
1	F	220	PHE	2.7
1	F	73	THR	2.7
1	E	189	ASN	2.7
1	C	24	GLN	2.7
1	D	194	GLY	2.6
1	A	25	PHE	2.6
1	F	76	ASP	2.6
1	F	51	ILE	2.6
1	A	24	GLN	2.6
1	F	24	GLN	2.6
1	A	12	VAL	2.5
1	F	23	ASN	2.5
1	D	170	TYR	2.5
1	E	14	PHE	2.5
1	E	172	LYS	2.5
1	A	176	LYS	2.4
1	F	60	ARG	2.3
1	F	195	ASP	2.3
1	E	52	VAL	2.3
1	F	69	ILE	2.3
1	E	220	PHE	2.3
1	B	12	VAL	2.3
1	D	195	ASP	2.3
1	A	51	ILE	2.3
1	A	69	ILE	2.3
1	F	53	ILE	2.3
1	F	70	ILE	2.3
1	A	180	ALA	2.3
1	A	172	LYS	2.2
1	F	87	ALA	2.2
1	E	24	GLN	2.2
1	C	52	VAL	2.2
1	D	51	ILE	2.2
1	F	180	ALA	2.2
1	A	50	GLY	2.2
1	A	7	ASN	2.2
1	B	24	GLN	2.1
1	C	217	CYS	2.1
1	A	178	LYS	2.1

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Mol	Chain	Res	Type	RSRZ
1	D	211	LYS	2.1
1	C	67	GLY	2.1
1	F	12	VAL	2.1
1	A	171	ASP	2.1
1	B	52	VAL	2.1
1	D	197	GLU	2.0
1	A	71	ARG	2.0
1	A	39	ILE	2.0
1	D	193	ILE	2.0
1	C	179	ASP	2.0

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

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

6.3 Carbohydrates (i)

There are no monosaccharides in this entry.

6.4 Ligands (i)

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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($Å^2$)	Q<0.9
2	UDP	D	1241	25/25	0.80	0.21	41,47,55,56	0
2	UDP	E	1241	25/25	0.81	0.21	44,47,53,55	0
2	UDP	B	1241	25/25	0.84	0.20	44,47,56,56	0
2	UDP	C	1241	25/25	0.86	0.18	42,46,54,55	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 UDP D 1241:

$2mF_o\text{-}DF_c$ (at 0.7 rmsd) in gray
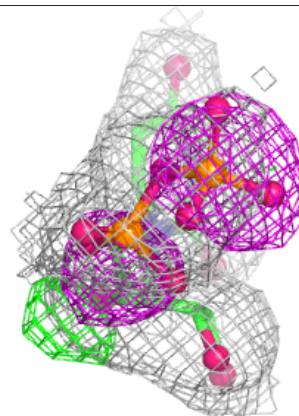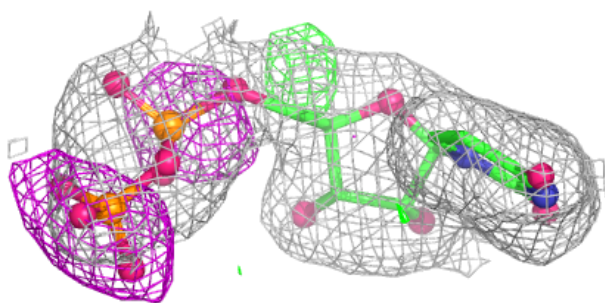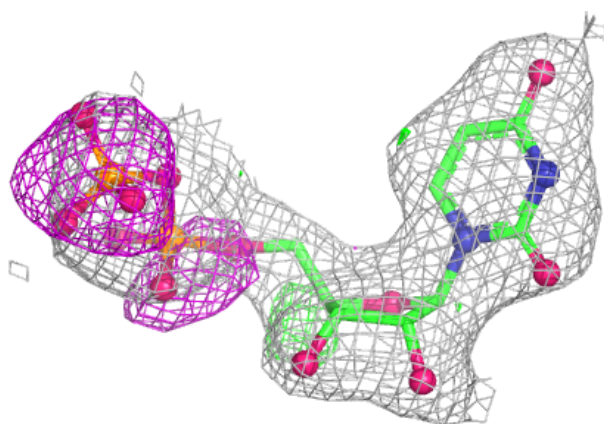$mF_o\text{-}DF_c$ (at 3 rmsd) in purple (negative)
and green (positive)
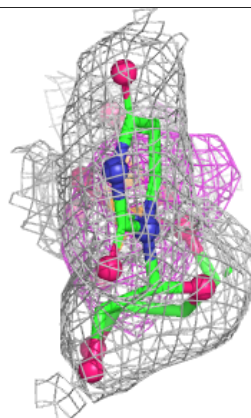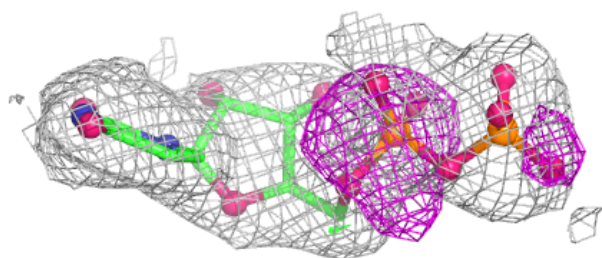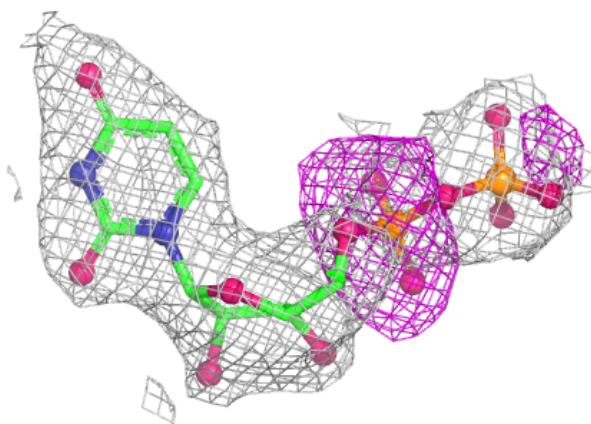
Electron density around UDP E 1241:

$2mF_o\text{-}DF_c$ (at 0.7 rmsd) in gray
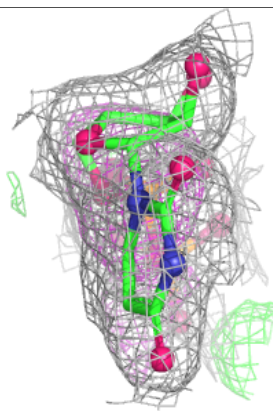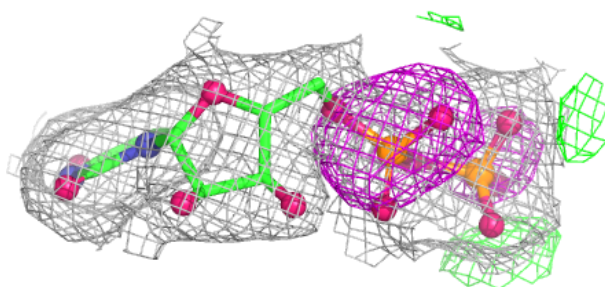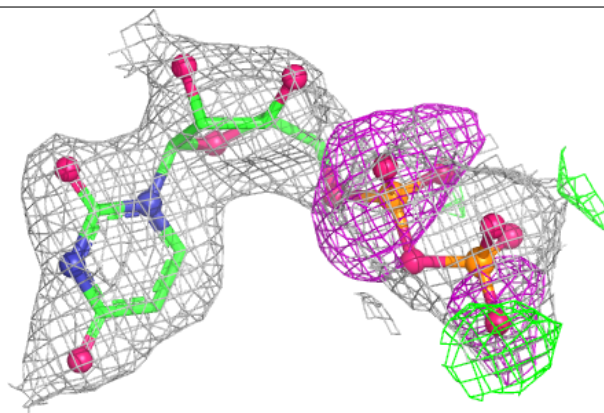$mF_o\text{-}DF_c$ (at 3 rmsd) in purple (negative)
and green (positive)
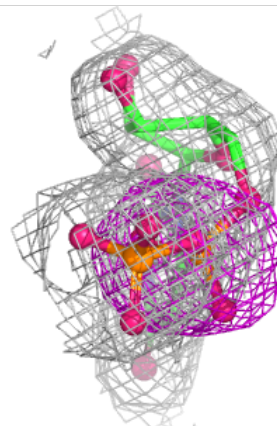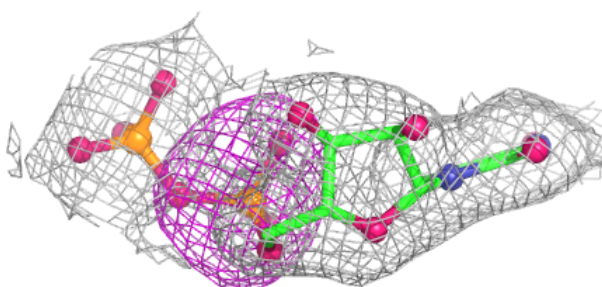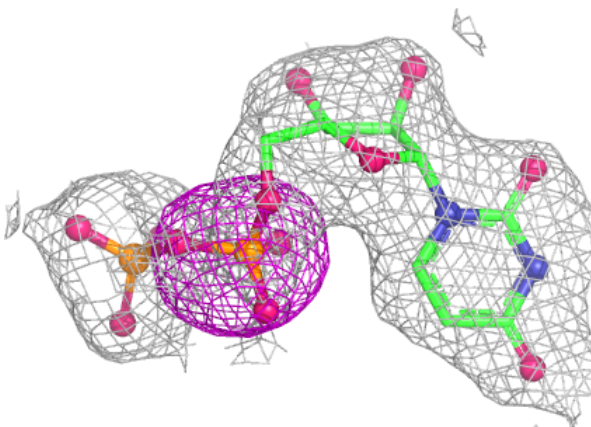
Electron density around UDP B 1241:

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

Electron density around UDP C 1241:

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

6.5 Other polymers ⓘ

There are no such residues in this entry.