Full wwPDB X-ray Structure Validation Report (i)

May 15, 2020 – 08:15 pm BST

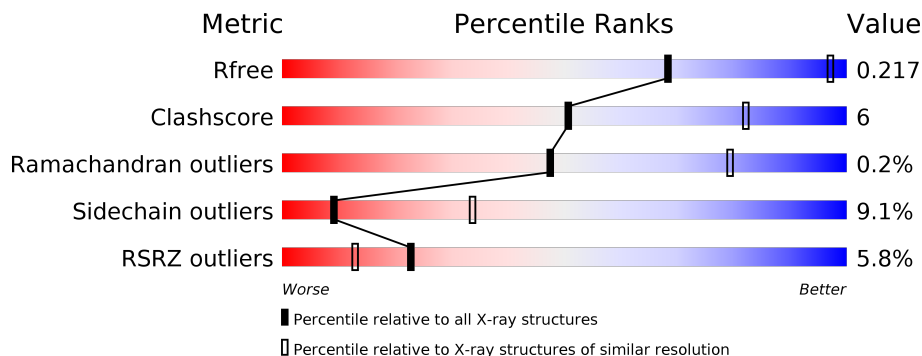|		
PDB ID	:	4X6L
Title	:	Crystal structure of S. aureus TarM in complex with UDP
Authors	:	Worrall, L.J.; Sobhanifar, S.; Gruninger, R.J.; Strynadka, N.C.
Deposited on	:	2014-12-08
Resolution	:	3.19 Å(reported)

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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 3.19 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		0.217
Clashscore		6
Ramachandran outliers		0.2%
Sidechain outliers		9.1%
RSRZ outliers		5.8%

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	1133 (3.20-3.20)
Clashscore	141614	1253 (3.20-3.20)
Ramachandran outliers	138981	1234 (3.20-3.20)
Sidechain outliers	138945	1233 (3.20-3.20)
RSRZ outliers	127900	1095 (3.20-3.20)

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 on 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.

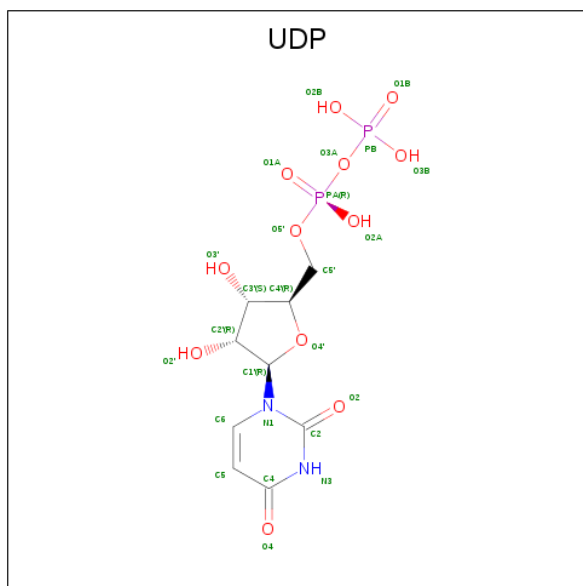| Mol	Chain	Length	Quality of chain
1	A	493	%　80%　19%　•
1	B	493	80%　17%　•
1	C	493	79%　19%　•
1	D	493	22%　79%　19%　•

2 Entry composition (i)

There are 2 unique types of molecules in this entry. The entry contains 16207 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 TarM.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	493	Total	C	N	O	S	0	0	0
			4033	2581	681	752	19			
1	B	493	Total	C	N	O	S	0	0	0
			4033	2581	681	752	19			
1	C	493	Total	C	N	O	S	0	0	0
			4033	2581	681	752	19			
1	D	493	Total	C	N	O	S	0	0	0
			4033	2581	681	752	19			

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

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

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

3 Residue-property plots ⓘ

These plots are drawn for all protein, RNA and DNA 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: TarM

Chain A:

- Molecule 1: TarM

Chain B:

- Molecule 1: TarM

Chain C:

K127 S128 V131 I132 D133 K136 K139 R140 N149 K150 V151 F157 N161 E171 G189 K190 T191 Y192 V193 L194 V195 N202 L206 M234 K240 K244 H249 D258 T259 S265 I280 V281 L282 R287 V296 E297 N298 I299 I302 S303

N304 I308 P312 V328 P329 R332 I333 D334 L335 L336 V339 V343 V344 V350 E357 K363 I364 A365 K366 L373 Y382 T383 T384 K388 E391 Q401 L407 S408 M409 P418 V419 S429 N435 K436 I441 M449 V457 N458 N459
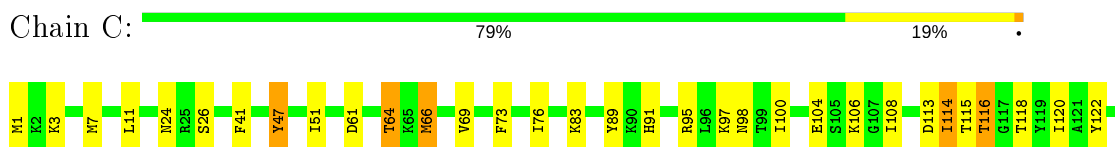
L462 E465 F466 S493

• **Molecule 1: TarM**

Chain D:

22%

79%   19%

M1 K2 K3 I4 M7 L11 D12 V13 M18 N24 F41 Y47 I50 I51 D61 T64 K65 V66 V69 F73 I76 S77 H81 F82 K83 Y89 K90 H91 R95 I96 K97 N98 T99 I100 E101 K106 Y111 F112 D113 I114 T115 T116

Y122 K127 S128 V131 I132 D133 K136 K139 R140 N149 K150 V151 E155 T156 F157 N161 Y169 D170 E171 Y174 S178 G189 K190 T191 Y192 V193 L194 V195 N196 K197 N202 L206 K240 D258 T259 S265 I280 R287 I290 V296

E297 N298 I299 I302 V306 K307 I308 P312 F315 Q316 T317 E318 K319 I320 V321 G322 H323 I324 S325 R326 M327 V328 P329 T330 K331 R332 I333 D334 L335 L336 I337 E338 V339 A340 E341 L342 V343 V344 A349 V350 K351 F352 H353 I354 Y355 G356 E357 G358 S359 V360 K361 D362 K363 I364 A365

K366 E369 D370 K371 N372 L373 E374 R375 N376 V377 F378 G381 Y382 T383 T384 T385 P386 Q387 K388 E391 D392 F393 K394 L395 V396 V397 S398 T399 S400 Q401 Q405 G406 L407 S408 M409 I410 E411 A412 S415 P418 V419 V420 A421 F422 D423 I424 G427 P428 S429 D430 F431 I432 E433

D434 N435 K436 N437 G438 Y439 L440 I441 H444 N445 I446 N447 D448 A450 D451 K452 I453 L454 Q455 L456 V457 N458 N459 L462 A463 A464 E465 F466 A470 I474 S493

4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 63	Depositor
Cell constants a, b, c, α, β, γ	162.29Å　162.29Å　228.02Å 90.00°　　90.00°　　120.00°	Depositor
Resolution (Å)	66.11　–　3.19 66.11　–　3.20	Depositor EDS
% Data completeness (in resolution range)	100.0 (66.11-3.19) 99.9 (66.11-3.20)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.06	Depositor
$<I/\sigma(I)>$ [1]	2.01 (at 3.19Å)	Xtriage
Refinement program	BUSTER-TNT, REFMAC	Depositor
R, R_{free}	0.165　,　0.191 0.190　,　0.217	Depositor DCC
R_{free} test set	2842 reflections (5.08%)	wwPDB-VP
Wilson B-factor (Å^2)	99.2	Xtriage
Anisotropy	0.187	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.30 , 73.5	EDS
L-test for twinning[2]	$<|L|> = 0.46$, $<L^2> = 0.29$	Xtriage
Estimated twinning fraction	0.055 for h,-h-k,-l	Xtriage
F_o,F_c correlation	0.95	EDS
Total number of atoms	16207	wwPDB-VP
Average B, all atoms (Å^2)	120.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.72% 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 (i)

5.1 Standard geometry (i)

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	0.49	0/4110	0.71	0/5516
1	B	0.51	0/4110	0.72	0/5516
1	C	0.51	0/4110	0.73	0/5516
1	D	0.48	0/4110	0.72	0/5516
All	All	0.50	0/16440	0.72	0/22064

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	4033	0	4057	41	0
1	B	4033	0	4057	49	0
1	C	4033	0	4057	50	0
1	D	4033	0	4057	46	0
2	A	25	0	11	0	0
2	B	25	0	11	1	0
2	C	25	0	11	1	0
All	All	16207	0	16261	186	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 6.

All (186) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:100:ILE:HG23	1:A:114:ILE:HG22	1.31	1.10
1:C:100:ILE:HG23	1:C:114:ILE:HG22	1.46	0.95
1:D:100:ILE:HG23	1:D:114:ILE:HG22	1.55	0.87
1:D:332:ARG:HG3	1:D:401:GLN:HG2	1.63	0.80
1:B:332:ARG:HH11	1:B:401:GLN:HE22	1.31	0.76
1:C:339:VAL:HG11	1:C:449:MET:HE2	1.71	0.72
1:C:191:THR:HG21	1:C:206:LEU:HD22	1.75	0.68
1:C:113:ASP:HB3	1:C:116:THR:HG22	1.78	0.65
1:C:140:ARG:HD3	1:C:157:PHE:CD2	2.32	0.64
1:D:343:VAL:HG12	1:D:350:VAL:HG11	1.80	0.63
1:C:339:VAL:O	1:C:343:VAL:HG23	1.98	0.63
1:B:249:HIS:HA	1:B:282:LEU:HD11	1.81	0.62
1:C:335:LEU:O	1:C:339:VAL:HG23	2.00	0.61
1:A:332:ARG:HB3	1:A:335:LEU:HD12	1.82	0.60
1:D:77:SER:HB2	1:D:195:VAL:HG11	1.82	0.60
1:C:249:HIS:HA	1:C:282:LEU:HD11	1.83	0.60
1:B:100:ILE:HG23	1:B:114:ILE:HG22	1.83	0.60
1:C:339:VAL:HG21	1:C:449:MET:HE1	1.83	0.60
1:A:77:SER:HB2	1:A:195:VAL:HG11	1.85	0.59
1:D:333:ILE:HG22	1:D:364:ILE:HG12	1.84	0.58
1:C:357:GLU:HG2	1:C:382:TYR:HB2	1.84	0.58
1:A:249:HIS:HA	1:A:282:LEU:HD11	1.88	0.56
1:D:140:ARG:HD3	1:D:157:PHE:CD1	2.40	0.56
1:D:280:ILE:HG12	1:D:302:ILE:HD12	1.87	0.56
1:A:343:VAL:HG12	1:A:350:VAL:HG11	1.87	0.56
1:C:409:MET:HG2	1:C:419:VAL:HG11	1.87	0.56
1:C:122:TYR:HB3	1:C:133:ASP:HB2	1.87	0.56
1:B:280:ILE:HG12	1:B:302:ILE:HD12	1.86	0.56
1:B:191:THR:HG21	1:B:206:LEU:HD22	1.87	0.56
1:C:343:VAL:HG12	1:C:350:VAL:HG11	1.87	0.56
1:A:280:ILE:HG12	1:A:302:ILE:HD12	1.88	0.55
1:A:140:ARG:HD3	1:A:157:PHE:CD1	2.41	0.55
1:B:343:VAL:HG12	1:B:350:VAL:HG11	1.88	0.55
1:B:332:ARG:HH11	1:B:401:GLN:NE2	2.01	0.55
1:C:280:ILE:HG12	1:C:302:ILE:HD12	1.88	0.55
1:D:98:ASN:HD21	1:D:114:ILE:HG13	1.71	0.55
1:B:98:ASN:HD21	1:B:114:ILE:HG13	1.70	0.55
1:C:113:ASP:CB	1:C:116:THR:HG22	2.37	0.55

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:113:ASP:HB3	1:D:116:THR:HG22	1.89	0.55
1:B:140:ARG:HD3	1:B:157:PHE:CD1	2.42	0.55
1:D:61:ASP:HB3	1:D:64:THR:HG22	1.90	0.54
1:A:189:GLY:O	1:A:202:ASN:HA	2.07	0.54
1:B:98:ASN:ND2	1:B:115:THR:HG22	2.22	0.54
1:B:113:ASP:HB3	1:B:116:THR:HG22	1.90	0.54
1:B:418:PRO:HB3	1:B:466:PHE:HB3	1.89	0.53
1:A:191:THR:HG21	1:A:206:LEU:HD22	1.89	0.53
1:A:333:ILE:HG23	1:A:336:LEU:HD23	1.89	0.53
1:C:61:ASP:HB3	1:C:64:THR:HG22	1.92	0.52
1:D:100:ILE:CG2	1:D:114:ILE:HG22	2.32	0.52
1:A:61:ASP:HB3	1:A:64:THR:HG22	1.92	0.52
1:C:98:ASN:ND2	1:C:115:THR:HG22	2.25	0.52
1:D:77:SER:CB	1:D:195:VAL:HG11	2.39	0.52
1:C:189:GLY:O	1:C:202:ASN:HA	2.09	0.52
1:C:383:THR:O	2:C:500:UDP:H5	1.92	0.52
1:B:123:ILE:HG12	1:B:132:ILE:HG12	1.92	0.51
1:B:287:ARG:HG3	1:B:299:ILE:HG22	1.91	0.51
1:D:191:THR:HG21	1:D:206:LEU:HD22	1.92	0.51
1:B:61:ASP:HB3	1:B:64:THR:HG22	1.92	0.51
1:A:287:ARG:HG3	1:A:299:ILE:HG22	1.92	0.51
1:A:429:SER:HA	1:A:440:LEU:HD21	1.93	0.51
1:C:116:THR:HG23	1:C:118:THR:OG1	2.11	0.51
1:C:98:ASN:HD21	1:C:114:ILE:HG13	1.76	0.51
1:D:423:ASP:HB2	1:D:440:LEU:HG	1.93	0.50
1:A:418:PRO:HB3	1:A:466:PHE:HB3	1.93	0.50
1:C:332:ARG:HB3	1:C:335:LEU:HD12	1.93	0.50
1:D:98:ASN:ND2	1:D:115:THR:HG22	2.26	0.50
1:D:287:ARG:HG3	1:D:299:ILE:HG22	1.94	0.50
1:D:409:MET:HG2	1:D:419:VAL:HG11	1.94	0.50
1:A:122:TYR:HB3	1:A:133:ASP:HB2	1.94	0.50
1:C:73:PHE:HA	1:C:76:ILE:HD12	1.93	0.50
1:D:178:SER:HB3	1:D:194:LEU:HD11	1.93	0.49
1:C:287:ARG:HG3	1:C:299:ILE:HG22	1.94	0.49
1:D:339:VAL:HG11	1:D:449:MET:HE2	1.95	0.49
1:C:418:PRO:HB3	1:C:466:PHE:HB3	1.94	0.49
1:B:441:ILE:HG21	1:B:449:MET:HB2	1.95	0.48
1:B:116:THR:HG23	1:B:118:THR:H	1.78	0.48
1:B:73:PHE:HA	1:B:76:ILE:HD12	1.96	0.48
1:B:339:VAL:HG11	1:B:449:MET:HE2	1.95	0.48
1:A:101:GLU:HB2	1:A:111:TYR:CE2	2.49	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:339:VAL:HG21	1:C:449:MET:CE	2.44	0.48
1:C:441:ILE:HG21	1:C:449:MET:HB2	1.95	0.48
1:D:73:PHE:HA	1:D:76:ILE:HD12	1.96	0.48
1:B:339:VAL:O	1:B:343:VAL:HG23	2.15	0.47
1:A:47:TYR:CZ	1:A:66:MET:HE1	2.49	0.47
1:D:122:TYR:HB3	1:D:133:ASP:HB2	1.97	0.47
1:D:433:GLU:HB2	1:D:437:ASN:HD21	1.80	0.46
1:A:328:VAL:HB	1:A:329:PRO:CD	2.46	0.46
1:A:441:ILE:HG21	1:A:449:MET:HB2	1.98	0.46
1:B:111:TYR:CE2	1:B:123:ILE:HD12	2.50	0.46
1:B:127:LYS:HG2	1:B:128:SER:H	1.80	0.46
1:B:429:SER:HA	1:B:440:LEU:HD21	1.96	0.46
1:B:189:GLY:O	1:B:202:ASN:HA	2.16	0.46
1:B:113:ASP:CB	1:B:116:THR:HG22	2.46	0.46
1:A:113:ASP:HB3	1:A:116:THR:HG22	1.98	0.46
1:A:123:ILE:HG12	1:A:132:ILE:HG12	1.98	0.46
1:A:333:ILE:HD12	1:A:333:ILE:H	1.80	0.46
1:D:127:LYS:HG2	1:D:128:SER:H	1.80	0.46
1:A:401:GLN:HB3	1:A:402:TYR:CD2	2.51	0.45
1:D:441:ILE:HG21	1:D:449:MET:HB2	1.98	0.45
1:D:77:SER:O	1:D:81:HIS:HD2	1.99	0.45
1:C:104:GLU:HB3	1:C:108:ILE:HG22	1.98	0.45
1:D:189:GLY:O	1:D:202:ASN:HA	2.16	0.45
1:A:140:ARG:HD2	1:A:161:ASN:OD1	2.16	0.45
1:B:7:MET:HG2	1:B:41:PHE:CZ	2.52	0.45
1:C:332:ARG:HH11	1:C:401:GLN:NE2	2.15	0.45
1:D:337:ILE:HG22	1:D:371:LYS:HD2	1.97	0.45
1:C:328:VAL:HB	1:C:329:PRO:CD	2.48	0.45
1:B:11:LEU:HD12	1:B:66:MET:HE2	1.99	0.44
1:B:41:PHE:HA	1:B:69:VAL:HG12	1.99	0.44
1:D:13:VAL:HG13	1:D:50:ILE:HG23	2.00	0.44
1:B:140:ARG:HD2	1:B:161:ASN:OD1	2.18	0.44
1:B:383:THR:O	2:B:500:UDP:H5	1.99	0.44
1:C:47:TYR:CZ	1:C:66:MET:HE1	2.52	0.44
1:A:7:MET:HG2	1:A:41:PHE:CZ	2.52	0.44
1:A:339:VAL:O	1:A:343:VAL:HG23	2.17	0.44
1:C:127:LYS:HG2	1:C:128:SER:H	1.83	0.44
1:A:339:VAL:HG11	1:A:449:MET:HE2	1.98	0.44
1:A:91:HIS:O	1:A:95:ARG:HG2	2.18	0.44
1:C:91:HIS:O	1:C:95:ARG:HG2	2.18	0.43
1:C:304:ASN:HD22	1:C:407:LEU:HD21	1.83	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:7:MET:HG2	1:C:41:PHE:CZ	2.53	0.43
1:D:91:HIS:CE1	1:D:95:ARG:HH11	2.36	0.43
1:A:116:THR:HG23	1:A:118:THR:OG1	2.19	0.43
1:B:98:ASN:ND2	1:B:114:ILE:HG13	2.33	0.43
1:D:91:HIS:O	1:D:95:ARG:HG2	2.18	0.43
1:A:127:LYS:HG2	1:A:128:SER:H	1.84	0.43
1:A:91:HIS:CE1	1:A:95:ARG:HH11	2.36	0.43
1:B:91:HIS:CE1	1:B:95:ARG:HH11	2.37	0.43
1:C:333:ILE:HG23	1:C:336:LEU:HD23	2.01	0.43
1:B:193:VAL:CG1	1:B:200:PHE:HE1	2.31	0.43
1:B:312:PRO:HG3	1:B:391:GLU:HG2	2.00	0.43
1:C:140:ARG:HD2	1:C:161:ASN:OD1	2.19	0.43
1:D:398:SER:HB3	1:D:421:ALA:HB2	2.00	0.43
1:D:169:TYR:HA	1:D:174:TYR:O	2.18	0.42
1:D:7:MET:HG2	1:D:41:PHE:CZ	2.54	0.42
1:C:332:ARG:HH11	1:C:401:GLN:HE22	1.67	0.42
1:D:113:ASP:CB	1:D:116:THR:HG22	2.49	0.42
1:B:234:MET:HG2	1:B:244:LYS:HD3	2.01	0.42
1:C:344:VAL:HG21	1:C:373:LEU:HD22	2.01	0.42
1:D:47:TYR:CZ	1:D:66:MET:HE1	2.54	0.42
1:B:135:PHE:CE2	1:B:140:ARG:HB2	2.53	0.42
1:D:325:SER:HB2	1:D:331:LYS:HD2	2.00	0.42
1:D:101:GLU:HG3	1:D:111:TYR:CE1	2.55	0.42
1:A:84:SER:HB3	1:A:86:LYS:HE3	2.01	0.42
1:C:98:ASN:HD21	1:C:115:THR:HG22	1.84	0.42
1:C:41:PHE:HA	1:C:69:VAL:HG12	2.00	0.42
1:C:91:HIS:CE1	1:C:95:ARG:HH11	2.38	0.42
1:D:41:PHE:HA	1:D:69:VAL:HG12	2.01	0.42
1:B:102:ILE:HD12	1:B:112:PHE:CD1	2.55	0.42
1:C:312:PRO:HG3	1:C:391:GLU:HG2	2.02	0.42
1:D:11:LEU:HD12	1:D:66:MET:HE2	2.01	0.42
1:A:77:SER:CB	1:A:195:VAL:HG11	2.49	0.42
1:B:26:SER:OG	1:B:64:THR:HB	2.20	0.42
1:B:91:HIS:O	1:B:95:ARG:HG2	2.20	0.42
1:C:234:MET:HG2	1:C:244:LYS:HD3	2.01	0.42
1:C:26:SER:OG	1:C:64:THR:HB	2.20	0.42
1:B:98:ASN:HD21	1:B:115:THR:HG22	1.85	0.41
1:C:113:ASP:HB2	1:C:120:ILE:HD11	2.02	0.41
1:D:312:PRO:HG3	1:D:391:GLU:HG2	2.01	0.41
1:A:87:LEU:HA	1:A:87:LEU:HD23	1.85	0.41
1:B:104:GLU:HB3	1:B:108:ILE:HG22	2.02	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:339:VAL:HG21	1:B:449:MET:CE	2.51	0.41
1:A:344:VAL:HG21	1:A:373:LEU:HD22	2.03	0.41
1:A:332:ARG:HG3	1:A:401:GLN:HE21	1.86	0.41
1:B:103:GLU:HG2	1:B:109:SER:OG	2.21	0.41
1:D:298:ASN:HA	1:D:298:ASN:HD22	1.70	0.41
1:D:89:TYR:CZ	1:D:151:VAL:HG12	2.54	0.41
1:A:89:TYR:CZ	1:A:151:VAL:HG12	2.55	0.41
1:A:26:SER:OG	1:A:64:THR:HB	2.20	0.41
1:C:298:ASN:HA	1:C:298:ASN:HD22	1.70	0.41
1:D:140:ARG:HD2	1:D:161:ASN:OD1	2.20	0.41
1:A:178:SER:HB3	1:A:194:LEU:HD11	2.03	0.41
1:B:77:SER:HA	1:B:195:VAL:HG11	2.03	0.41
1:B:344:VAL:HG21	1:B:373:LEU:HD22	2.02	0.41
1:C:89:TYR:CZ	1:C:151:VAL:HG12	2.56	0.41
1:D:337:ILE:HD11	1:D:364:ILE:HG23	2.03	0.41
1:A:234:MET:HG2	1:A:244:LYS:HD3	2.03	0.40
1:B:89:TYR:CZ	1:B:151:VAL:HG12	2.57	0.40
1:B:127:LYS:HG2	1:B:128:SER:N	2.37	0.40
1:C:116:THR:HG23	1:C:118:THR:H	1.86	0.40
1:D:344:VAL:HG21	1:D:373:LEU:HD22	2.02	0.40
1:C:11:LEU:HD12	1:C:66:MET:HE2	2.02	0.40
1:D:127:LYS:HG2	1:D:128:SER:N	2.36	0.40
1:A:239:HIS:HB3	1:A:242:ALA:HB3	2.04	0.40
1:B:363:LYS:H	1:B:363:LYS:HG2	1.71	0.40
1:B:47:TYR:CZ	1:B:66:MET:HE1	2.57	0.40

There are no symmetry-related clashes.

5.3   Torsion angles (i)

5.3.1   Protein backbone (i)

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

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

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	491/493 (100%)	457 (93%)	33 (7%)	1 (0%)	47	79

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	B	491/493 (100%)	462 (94%)	28 (6%)	1 (0%)	47	79
1	C	491/493 (100%)	461 (94%)	29 (6%)	1 (0%)	47	79
1	D	491/493 (100%)	456 (93%)	34 (7%)	1 (0%)	47	79
All	All	1964/1972 (100%)	1836 (94%)	124 (6%)	4 (0%)	47	79

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	298	ASN
1	B	298	ASN
1	C	298	ASN
1	D	298	ASN

5.3.2 Protein sidechains (i)

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	449/449 (100%)	407 (91%)	42 (9%)	8	33
1	B	449/449 (100%)	409 (91%)	40 (9%)	9	35
1	C	449/449 (100%)	408 (91%)	41 (9%)	9	34
1	D	449/449 (100%)	409 (91%)	40 (9%)	9	35
All	All	1796/1796 (100%)	1633 (91%)	163 (9%)	9	34

All (163) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	1	MET
1	A	3	LYS
1	A	24	ASN
1	A	47	TYR
1	A	51	ILE
1	A	64	THR
1	A	66	MET

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Mol	Chain	Res	Type
1	A	83	LYS
1	A	96	LEU
1	A	103	GLU
1	A	106	LYS
1	A	115	THR
1	A	116	THR
1	A	127	LYS
1	A	131	VAL
1	A	136	LYS
1	A	139	LYS
1	A	140	ARG
1	A	149	ASN
1	A	155	GLU
1	A	171	GLU
1	A	190	LYS
1	A	193	VAL
1	A	240	LYS
1	A	258	ASP
1	A	259	THR
1	A	265	SER
1	A	296	VAL
1	A	298	ASN
1	A	308	ILE
1	A	363	LYS
1	A	364	ILE
1	A	366	LYS
1	A	384	THR
1	A	388	LYS
1	A	401	GLN
1	A	429	SER
1	A	435	ASN
1	A	457	VAL
1	A	459	ASN
1	A	462	LEU
1	A	465	GLU
1	B	3	LYS
1	B	24	ASN
1	B	47	TYR
1	B	51	ILE
1	B	64	THR
1	B	66	MET
1	B	83	LYS

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Mol	Chain	Res	Type
1	B	97	LYS
1	B	106	LYS
1	B	114	ILE
1	B	115	THR
1	B	127	LYS
1	B	131	VAL
1	B	136	LYS
1	B	139	LYS
1	B	140	ARG
1	B	149	ASN
1	B	171	GLU
1	B	190	LYS
1	B	193	VAL
1	B	195	VAL
1	B	202	ASN
1	B	240	LYS
1	B	258	ASP
1	B	259	THR
1	B	265	SER
1	B	296	VAL
1	B	298	ASN
1	B	308	ILE
1	B	363	LYS
1	B	364	ILE
1	B	366	LYS
1	B	384	THR
1	B	388	LYS
1	B	429	SER
1	B	435	ASN
1	B	457	VAL
1	B	459	ASN
1	B	462	LEU
1	B	465	GLU
1	C	1	MET
1	C	3	LYS
1	C	24	ASN
1	C	47	TYR
1	C	51	ILE
1	C	64	THR
1	C	66	MET
1	C	83	LYS
1	C	97	LYS

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Mol	Chain	Res	Type
1	C	106	LYS
1	C	114	ILE
1	C	116	THR
1	C	127	LYS
1	C	131	VAL
1	C	136	LYS
1	C	139	LYS
1	C	140	ARG
1	C	149	ASN
1	C	171	GLU
1	C	190	LYS
1	C	193	VAL
1	C	195	VAL
1	C	240	LYS
1	C	258	ASP
1	C	259	THR
1	C	265	SER
1	C	296	VAL
1	C	298	ASN
1	C	308	ILE
1	C	363	LYS
1	C	364	ILE
1	C	366	LYS
1	C	384	THR
1	C	388	LYS
1	C	429	SER
1	C	435	ASN
1	C	436	LYS
1	C	457	VAL
1	C	459	ASN
1	C	462	LEU
1	C	465	GLU
1	D	1	MET
1	D	3	LYS
1	D	18	MET
1	D	24	ASN
1	D	47	TYR
1	D	51	ILE
1	D	64	THR
1	D	66	MET
1	D	83	LYS
1	D	97	LYS

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Mol	Chain	Res	Type
1	D	106	LYS
1	D	114	ILE
1	D	115	THR
1	D	127	LYS
1	D	131	VAL
1	D	136	LYS
1	D	139	LYS
1	D	140	ARG
1	D	149	ASN
1	D	155	GLU
1	D	171	GLU
1	D	193	VAL
1	D	197	LYS
1	D	240	LYS
1	D	258	ASP
1	D	259	THR
1	D	265	SER
1	D	296	VAL
1	D	298	ASN
1	D	308	ILE
1	D	363	LYS
1	D	364	ILE
1	D	366	LYS
1	D	384	THR
1	D	388	LYS
1	D	429	SER
1	D	457	VAL
1	D	459	ASN
1	D	462	LEU
1	D	465	GLU

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (23) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	91	HIS
1	A	241	ASN
1	A	298	ASN
1	A	444	HIS
1	B	81	HIS
1	B	98	ASN
1	B	203	ASN
1	B	241	ASN

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Mol	Chain	Res	Type
1	B	298	ASN
1	B	401	GLN
1	B	444	HIS
1	C	81	HIS
1	C	98	ASN
1	C	203	ASN
1	C	241	ASN
1	C	298	ASN
1	C	401	GLN
1	D	81	HIS
1	D	98	ASN
1	D	241	ASN
1	D	298	ASN
1	D	437	ASN
1	D	444	HIS

5.3.3 RNA (i)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates (i)

There are no carbohydrates in this entry.

5.6 Ligand geometry (i)

3 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	C	500	-	20,26,26	1.01	2 (10%)	25,40,40	1.14	1 (4%)
2	UDP	A	500	-	20,26,26	0.98	2 (10%)	25,40,40	1.06	1 (4%)
2	UDP	B	500	-	20,26,26	1.05	3 (15%)	25,40,40	1.08	1 (4%)

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	UDP	C	500	-	-	4/14/32/32	0/2/2/2
2	UDP	A	500	-	-	4/14/32/32	0/2/2/2
2	UDP	B	500	-	-	3/14/32/32	0/2/2/2

All (7) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	C	500	UDP	C4-N3	2.95	1.38	1.33
2	B	500	UDP	C4-N3	2.88	1.38	1.33
2	A	500	UDP	C4-N3	2.81	1.37	1.33
2	C	500	UDP	C6-N1	2.37	1.38	1.35
2	B	500	UDP	C6-N1	2.31	1.38	1.35
2	A	500	UDP	C6-N1	2.18	1.38	1.35
2	B	500	UDP	PB-O3B	2.06	1.62	1.54

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	C	500	UDP	C5-C4-N3	-3.91	114.71	123.31
2	B	500	UDP	C5-C4-N3	-3.91	114.72	123.31
2	A	500	UDP	C5-C4-N3	-3.87	114.80	123.31

There are no chirality outliers.

All (11) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	C	500	UDP	C5'-O5'-PA-O1A
2	C	500	UDP	C5'-O5'-PA-O3A
2	A	500	UDP	PA-O3A-PB-O3B
2	B	500	UDP	PA-O3A-PB-O3B

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Mol	Chain	Res	Type	Atoms
2	C	500	UDP	PB-O3A-PA-O5'
2	A	500	UDP	PA-O3A-PB-O1B
2	B	500	UDP	PA-O3A-PB-O1B
2	A	500	UDP	PA-O3A-PB-O2B
2	B	500	UDP	O4'-C4'-C5'-O5'
2	C	500	UDP	O4'-C4'-C5'-O5'
2	A	500	UDP	O4'-C4'-C5'-O5'

There are no ring outliers.

2 monomers are involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	C	500	UDP	1	0
2	B	500	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 C 500

Bond lengths

Bond angles

Torsions

Rings

Ligand UDP A 500

Bond lengths

Bond angles

Torsions

Rings

Ligand UDP B 500

Bond lengths

Bond angles

Torsions

Rings
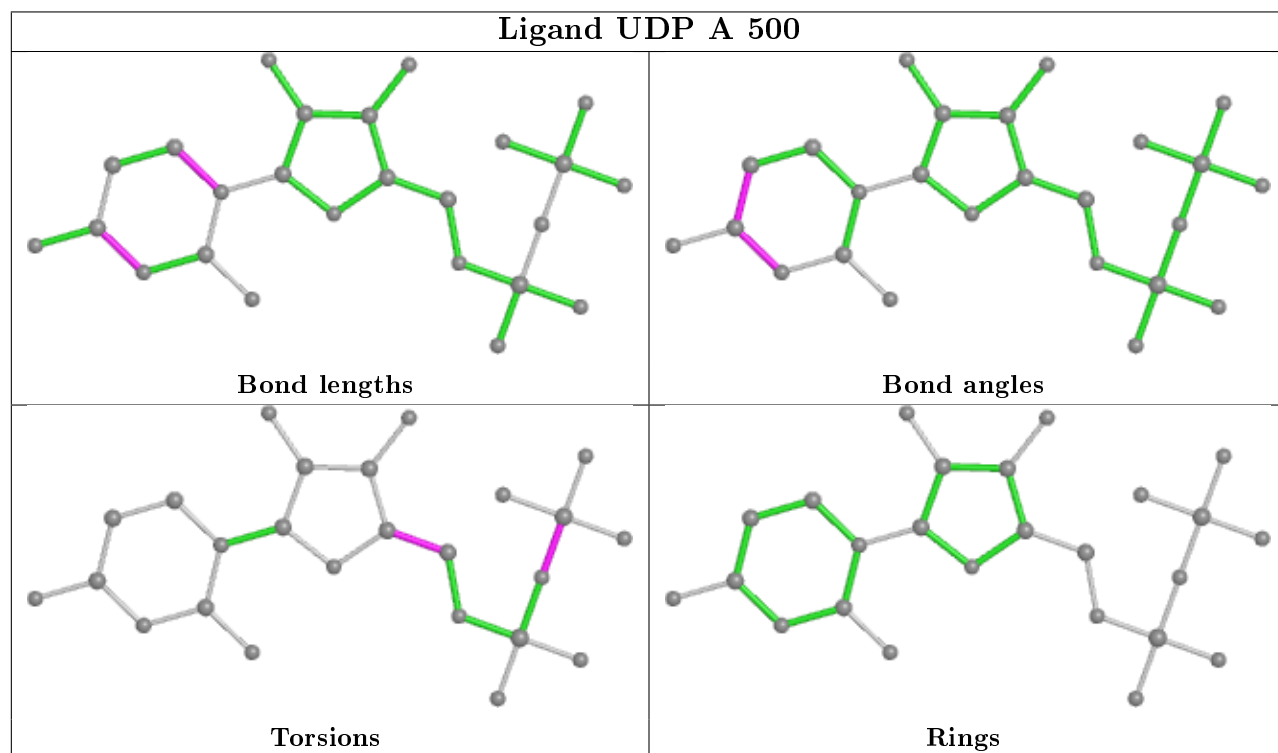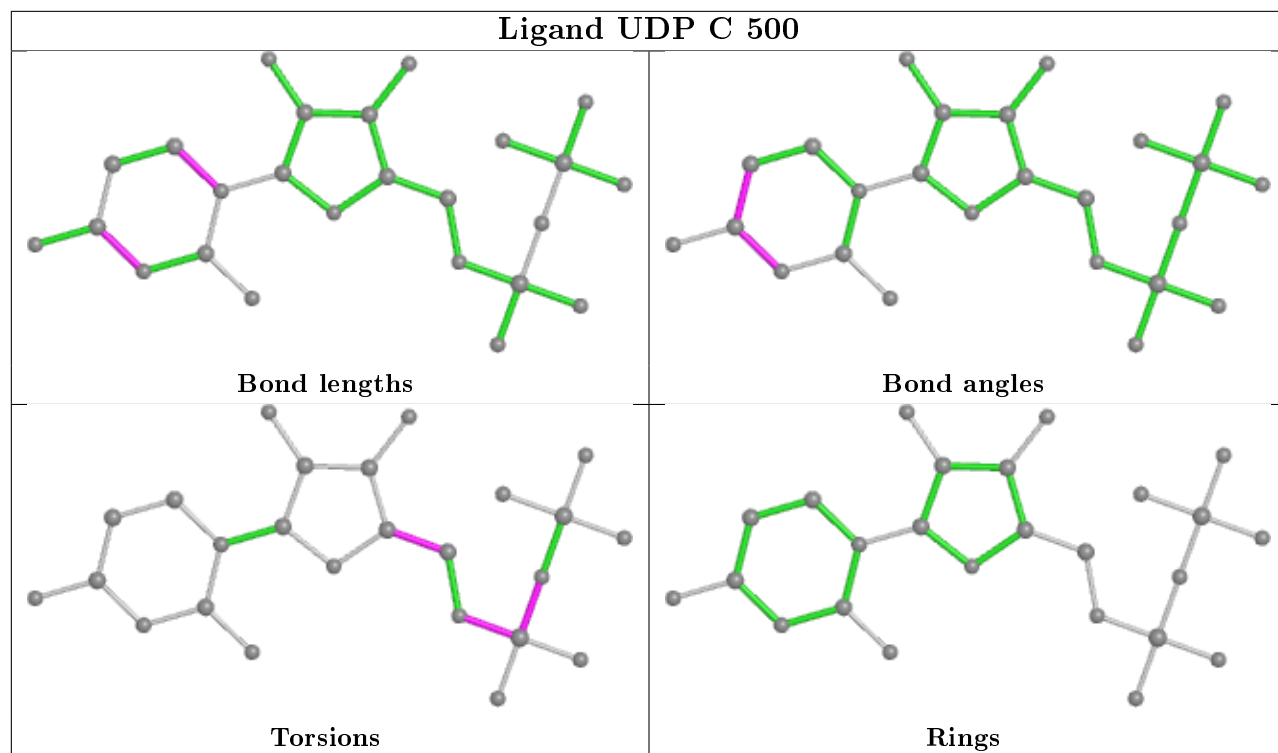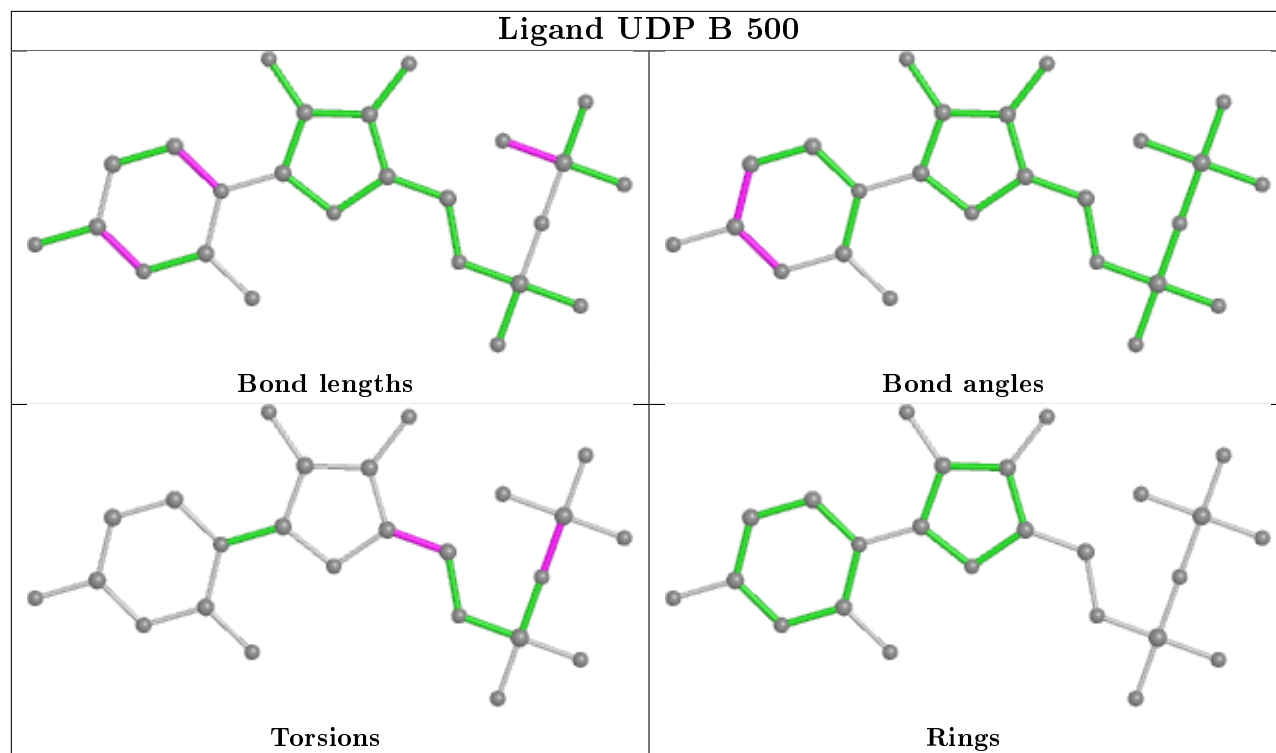
5.7 Other polymers (i)

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 (i)

6.1 Protein, DNA and RNA chains (i)

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

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2			OWAB(Å^2)	Q<0.9
1	A	493/493 (100%)	-0.05	3 (0%)	89	83	77, 112, 147, 163	0
1	B	493/493 (100%)	0.01	1 (0%)	95	94	62, 97, 139, 163	0
1	C	493/493 (100%)	-0.02	0	100	100	62, 103, 140, 159	0
1	D	493/493 (100%)	1.00	110 (22%)	0	0	67, 148, 269, 277	0
All	All	1972/1972 (100%)	0.24	114 (5%)	23	13	62, 109, 252, 277	0

All (114) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	396	VAL	15.0
1	D	453	ILE	11.5
1	D	337	ILE	9.5
1	D	336	LEU	9.2
1	D	454	LEU	8.5
1	D	449	MET	8.2
1	D	397	VAL	7.7
1	D	447	ASN	7.1
1	D	451	ASP	6.8
1	D	324	ILE	6.4
1	D	432	ILE	6.2
1	D	349	ALA	6.0
1	D	457	VAL	6.0
1	D	322	GLY	5.9
1	D	456	LEU	5.9
1	D	319	LYS	5.8
1	D	450	ALA	5.5
1	D	466	PHE	5.4
1	D	365	ALA	5.4
1	D	375	ARG	5.4
1	D	419	VAL	5.2

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Mol	Chain	Res	Type	RSRZ
1	D	340	ALA	5.2
1	D	359	SER	5.2
1	D	463	ALA	5.1
1	D	318	GLU	5.0
1	D	395	LEU	5.0
1	D	356	GLY	4.9
1	D	439	TYR	4.9
1	D	333	ILE	4.9
1	D	428	PRO	4.8
1	D	435	ASN	4.7
1	D	398	SER	4.6
1	D	388	LYS	4.5
1	D	323	HIS	4.5
1	D	330	THR	4.4
1	D	420	VAL	4.3
1	D	317	THR	4.2
1	D	384	THR	4.1
1	D	418	PRO	4.1
1	D	438	GLY	4.0
1	D	370	ASP	4.0
1	D	341	GLU	3.9
1	D	343	VAL	3.8
1	D	444	HIS	3.8
1	D	338	GLU	3.7
1	D	329	PRO	3.7
1	D	458	ASN	3.7
1	D	320	ILE	3.7
1	D	410	ILE	3.7
1	D	334	ASP	3.6
1	D	474	ILE	3.6
1	D	392	ASP	3.6
1	D	421	ALA	3.5
1	D	422	PHE	3.5
1	D	431	PHE	3.5
1	D	308	ILE	3.5
1	D	381	GLY	3.5
1	D	353	HIS	3.4
1	D	342	LEU	3.4
1	D	357	GLU	3.4
1	D	354	ILE	3.3
1	D	372	ASN	3.3
1	D	386	PRO	3.2

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Mol	Chain	Res	Type	RSRZ
1	D	408	SER	3.2
1	D	307	LYS	3.2
1	D	377	VAL	3.2
1	D	351	LYS	3.2
1	D	434	ASP	3.2
1	D	316	GLN	3.1
1	D	407	LEU	3.1
1	D	455	GLN	3.0
1	D	339	VAL	2.9
1	D	427	GLY	2.9
1	D	369	GLU	2.9
1	D	493	SER	2.8
1	D	328	VAL	2.8
1	D	411	GLU	2.8
1	D	452	LYS	2.8
1	D	446	ILE	2.7
1	D	321	VAL	2.7
1	D	412	ALA	2.7
1	D	385	THR	2.6
1	D	437	ASN	2.6
1	D	424	ILE	2.6
1	D	325	SER	2.6
1	D	374	GLU	2.6
1	D	445	ASN	2.6
1	D	387	GLN	2.5
1	D	448	ASP	2.5
1	D	326	ARG	2.5
1	D	315	PHE	2.5
1	D	391	GLU	2.5
1	D	4	ILE	2.4
1	D	373	LEU	2.4
1	D	440	LEU	2.4
1	D	376	ASN	2.4
1	D	290	ILE	2.4
1	D	382	TYR	2.3
1	A	352	PHE	2.3
1	A	377	VAL	2.3
1	D	459	ASN	2.3
1	D	405	GLN	2.2
1	D	415	SER	2.2
1	D	470	ALA	2.2
1	D	366	LYS	2.2

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Mol	Chain	Res	Type	RSRZ
1	D	378	PHE	2.1
1	B	320	ILE	2.1
1	D	306	VAL	2.1
1	D	400	SER	2.1
1	A	456	LEU	2.1
1	D	362	ASP	2.1
1	D	393	PHE	2.1
1	D	327	MET	2.0
1	D	360	VAL	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 carbohydrates 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.

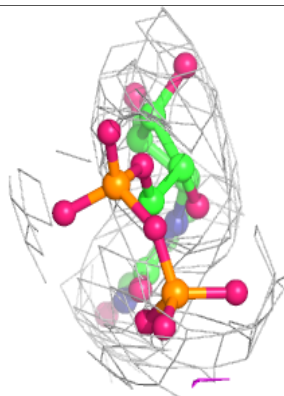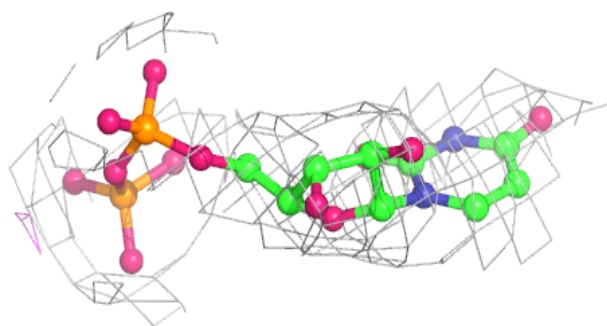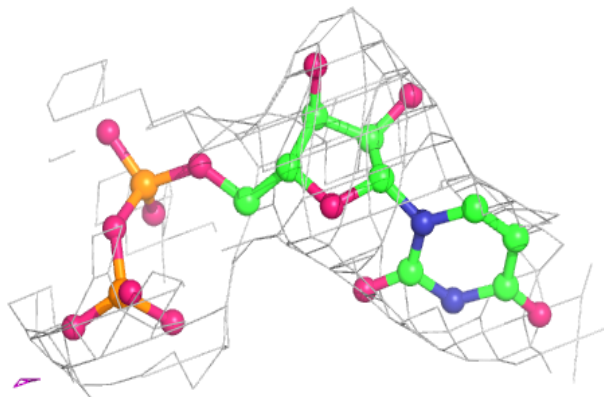| Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
2	UDP	B	500	25/25	0.92	0.21	107,118,124,127	0
2	UDP	A	500	25/25	0.95	0.20	117,131,134,140	0
2	UDP	C	500	25/25	0.95	0.24	107,122,129,130	0

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.
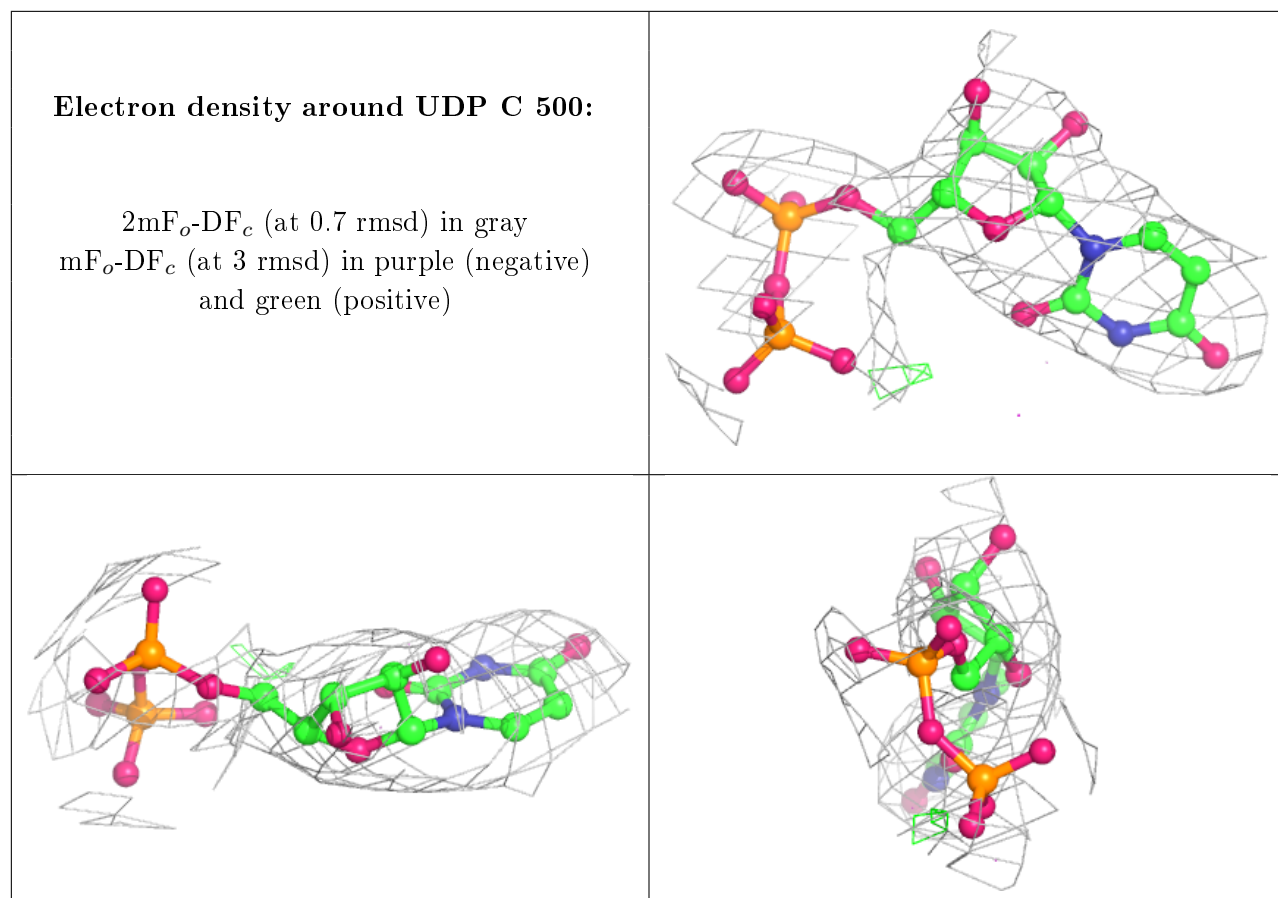
Electron density around UDP B 500:

$2mF_o\text{-}DF_c$ (at 0.7 rmsd) in gray
$mF_o\text{-}DF_c$ (at 3 rmsd) in purple (negative)
and green (positive)
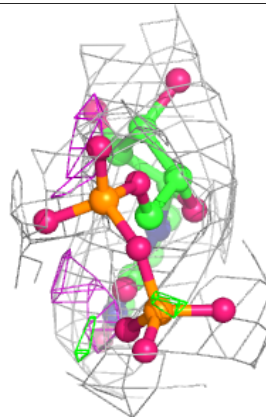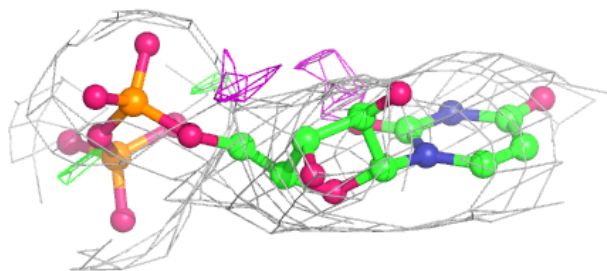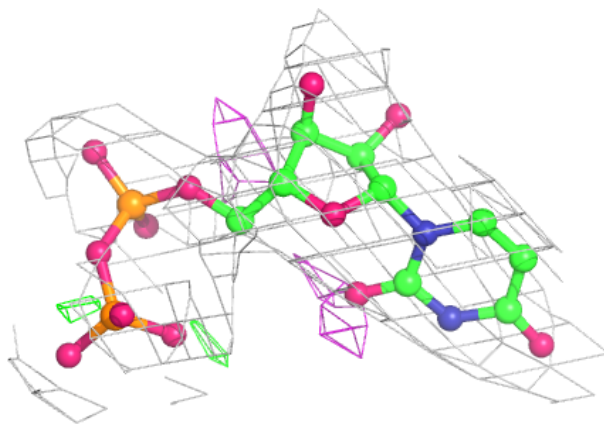
Electron density around UDP A 500:

$2mF_o\text{-}DF_c$ (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 500:

$2mF_o$-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.