



Full wwPDB X-ray Structure Validation Report ⓘ

Sep 24, 2024 – 04:08 PM EDT

PDB ID : 8VZA
Title : Crystal Structure of 2-Hydroxacyl-CoA Lyase/Synthase ApbHACS from Alphaproteobacteria bacterium in the Complex with THDP, L-Lactyl-CoA, and ADP
Authors : Gade, P.; Kim, Y.; Endres, M.; Lee, S.; Yoshikuni, Y.; Gonzalez, R.; Michalska, K.; Joachimiak, A.
Deposited on : 2024-02-11
Resolution : 2.05 Å(reported)

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

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

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

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

MolProbity : 4.02b-467
Mogul : 2022.3.0, CSD as543be (2022)
Xtrriage (Phenix) : 1.20.1
EDS : 3.0
buster-report : 1.1.7 (2018)
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4 : 9.0.002 (Gargrove)
Density-Fitness : 1.0.11
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.38.3

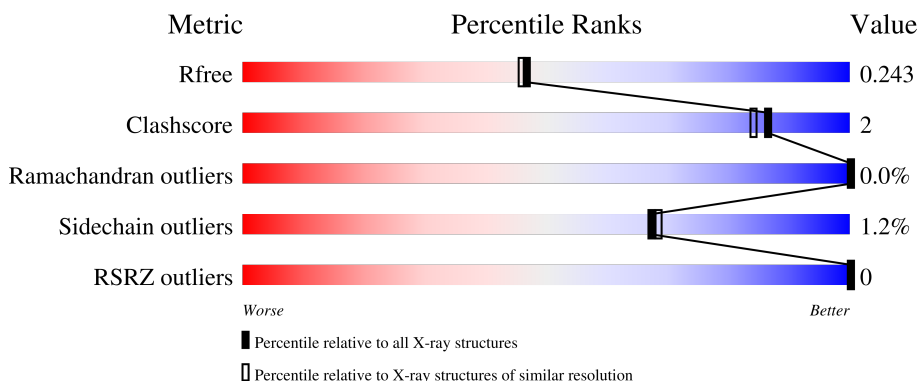
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

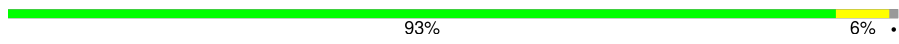
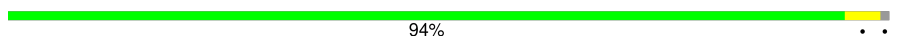
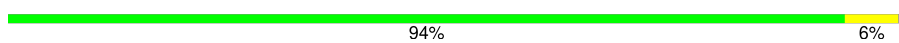
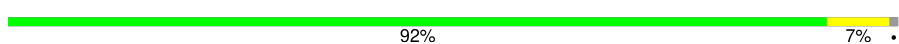
The reported resolution of this entry is 2.05 Å.

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



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	164625	2096 (2.04-2.04)
Clashscore	180529	2229 (2.04-2.04)
Ramachandran outliers	177936	2217 (2.04-2.04)
Sidechain outliers	177891	2217 (2.04-2.04)
RSRZ outliers	164620	2096 (2.04-2.04)

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

Mol	Chain	Length	Quality of chain
1	A	560	 93% 6%
1	B	560	 94%
1	C	560	 94% 6%
1	D	560	 92% 7%

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard

residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
2	8FL	A	601	X	-	-	-
2	8FL	B	602	X	-	-	-
2	8FL	C	601	X	-	-	-
2	8FL	D	601	X	-	-	-

2 Entry composition i

There are 8 unique types of molecules in this entry. The entry contains 17914 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 2-Hydroxyacyl-CoA lyase/Synthase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	554	Total 4185	C 2642	N 751	O 768	S 24	0	3	0
1	B	553	Total 4159	C 2627	N 747	O 762	S 23	0	1	0
1	C	557	Total 4183	C 2641	N 752	O 767	S 23	0	1	0
1	D	553	Total 4159	C 2627	N 747	O 762	S 23	0	1	0

There are 24 discrepancies between the modelled and reference sequences:

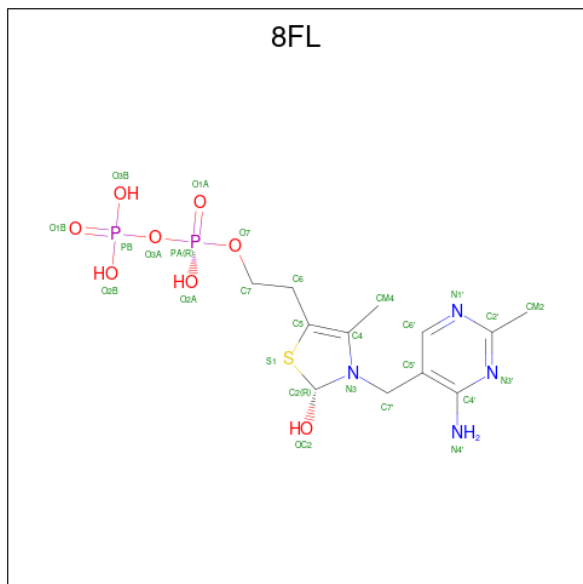
Chain	Residue	Modelled	Actual	Comment	Reference
A	-5	TYR	-	expression tag	UNP A0A3C0TX30
A	-4	PHE	-	expression tag	UNP A0A3C0TX30
A	-3	GLN	-	expression tag	UNP A0A3C0TX30
A	-2	SER	-	expression tag	UNP A0A3C0TX30
A	-1	ASN	-	expression tag	UNP A0A3C0TX30
A	0	ALA	-	expression tag	UNP A0A3C0TX30
B	-5	TYR	-	expression tag	UNP A0A3C0TX30
B	-4	PHE	-	expression tag	UNP A0A3C0TX30
B	-3	GLN	-	expression tag	UNP A0A3C0TX30
B	-2	SER	-	expression tag	UNP A0A3C0TX30
B	-1	ASN	-	expression tag	UNP A0A3C0TX30
B	0	ALA	-	expression tag	UNP A0A3C0TX30
C	-5	TYR	-	expression tag	UNP A0A3C0TX30
C	-4	PHE	-	expression tag	UNP A0A3C0TX30
C	-3	GLN	-	expression tag	UNP A0A3C0TX30
C	-2	SER	-	expression tag	UNP A0A3C0TX30
C	-1	ASN	-	expression tag	UNP A0A3C0TX30
C	0	ALA	-	expression tag	UNP A0A3C0TX30
D	-5	TYR	-	expression tag	UNP A0A3C0TX30
D	-4	PHE	-	expression tag	UNP A0A3C0TX30
D	-3	GLN	-	expression tag	UNP A0A3C0TX30

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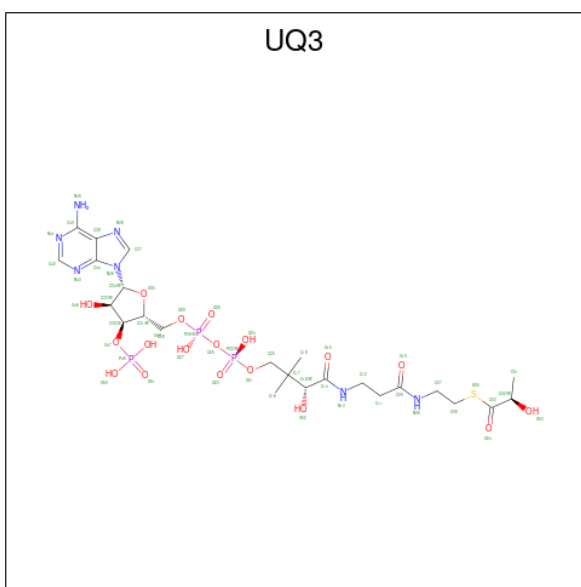
Chain	Residue	Modelled	Actual	Comment	Reference
D	-2	SER	-	expression tag	UNP A0A3C0TX30
D	-1	ASN	-	expression tag	UNP A0A3C0TX30
D	0	ALA	-	expression tag	UNP A0A3C0TX30

- Molecule 2 is 2-[(2R)-3-[(4-azanyl-2-methyl-pyrimidin-5-yl)methyl]-4-methyl-2-oxidanyl-2-H-1,3-thiazol-5-yl]ethyl phosphono hydrogen phosphate (three-letter code: 8FL) (formula: C₁₂H₂₀N₄O₈P₂S) (labeled as "Ligand of Interest" by depositor).



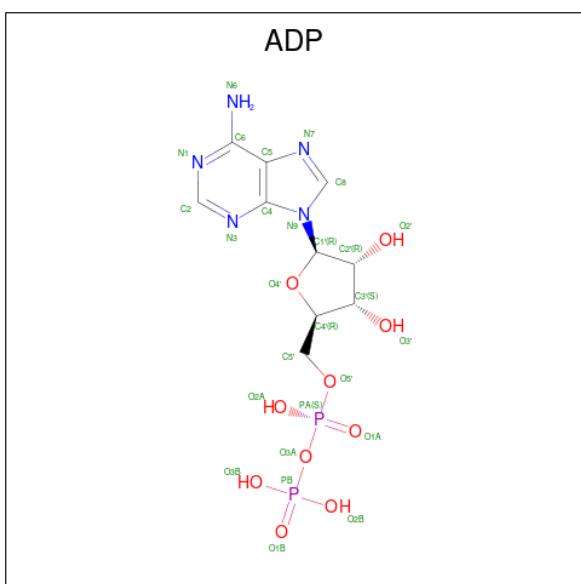
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	
			Total	C	N	O	P			S
2	A	1	Total	C	N	O	P	S	0	0
			27	12	4	8	2	1		
2	B	1	Total	C	N	O	P	S	0	0
			27	12	4	8	2	1		
2	C	1	Total	C	N	O	P	S	0	0
			27	12	4	8	2	1		
2	D	1	Total	C	N	O	P	S	0	0
			27	12	4	8	2	1		

- Molecule 3 is S-{(3S,5R,9R)-1-[(2R,3S,4R,5R)-5-(6-amino-9H-purin-9-yl)-4-hydroxy-3-(phosphonoxy)oxolan-2-yl]-3,5,9-trihydroxy-8,8-dimethyl-3,5,10,14-tetraoxo-2,4,6-trioxa-11,15-diaza-3lambda 5 ,5lambda 5 -diphosphaheptadecan-17-yl} (2R)-2-hydroxypropanethioate (three-letter code: UQ3) (formula: C₂₄H₄₀N₇O₁₈P₃S) (labeled as "Ligand of Interest" by depositor).



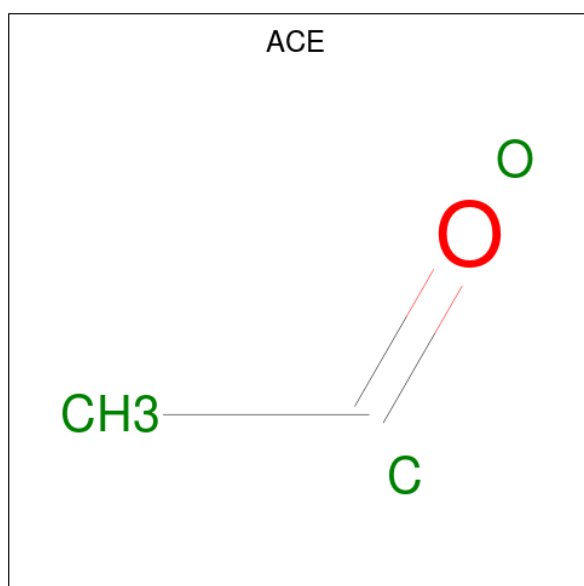
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf		
			Total	C	N	O	P			S	
3	A	1	Total	50	22	7	17	3	1	0	0
3	B	1	Total	50	22	7	17	3	1	0	0
3	C	1	Total	50	22	7	17	3	1	0	0
3	D	1	Total	50	22	7	17	3	1	0	0

- Molecule 4 is ADENOSINE-5'-DIPHOSPHATE (three-letter code: ADP) (formula: $C_{10}H_{15}N_5O_{10}P_2$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
4	A	1	Total	C	N	O	P	0	0
			27	10	5	10	2		
4	B	1	Total	C	N	O	P	0	0
			27	10	5	10	2		
4	C	1	Total	C	N	O	P	0	0
			27	10	5	10	2		
4	D	1	Total	C	N	O	P	0	0
			27	10	5	10	2		

- Molecule 5 is ACETYL GROUP (three-letter code: ACE) (formula: C₂H₄O).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	A	1	Total	C	O	0	0
			3	2	1		
5	B	1	Total	C	O	0	0
			3	2	1		
5	C	1	Total	C	O	0	0
			3	2	1		
5	C	1	Total	C	O	0	0
			3	2	1		

- Molecule 6 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

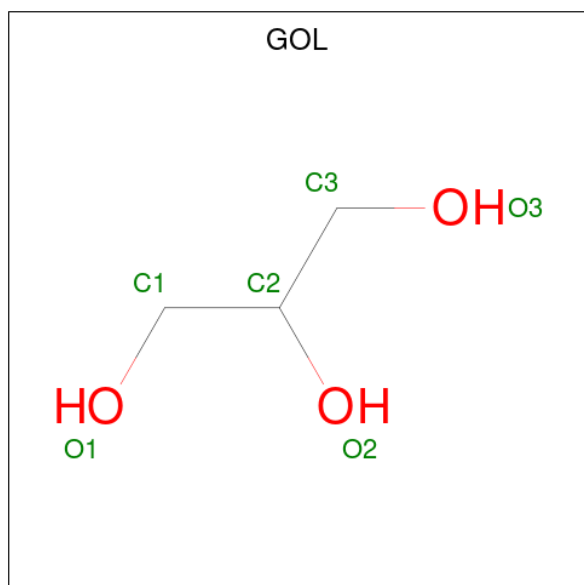
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	1	Total	Mg	0	0
			1	1		
6	B	1	Total	Mg	0	0
			1	1		

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Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	C	1	Total Mg 1 1	0	0
6	D	1	Total Mg 1 1	0	0

- Molecule 7 is GLYCEROL (three-letter code: GOL) (formula: C₃H₈O₃).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
7	B	1	Total C O 6 3 3	0	0

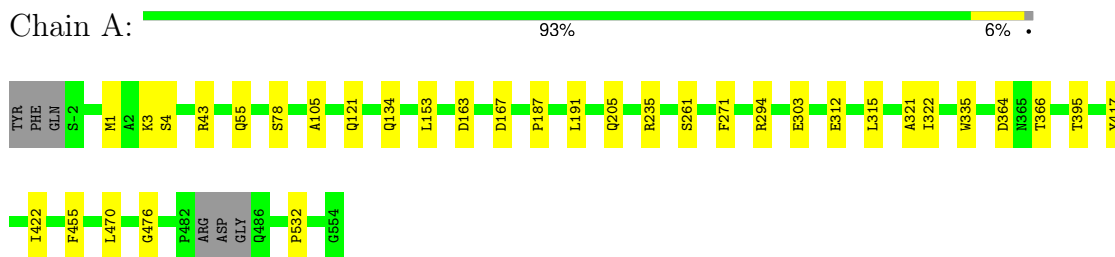
- Molecule 8 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
8	A	199	Total O 199 199	0	0
8	B	204	Total O 204 204	0	0
8	C	185	Total O 185 185	0	0
8	D	202	Total O 202 202	0	0

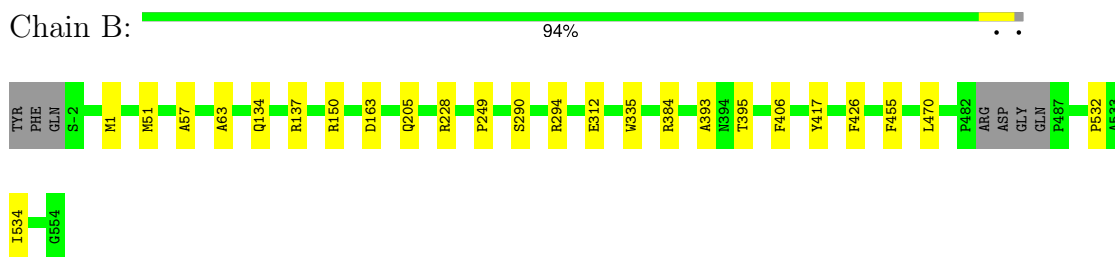
3 Residue-property plots [i](#)

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.

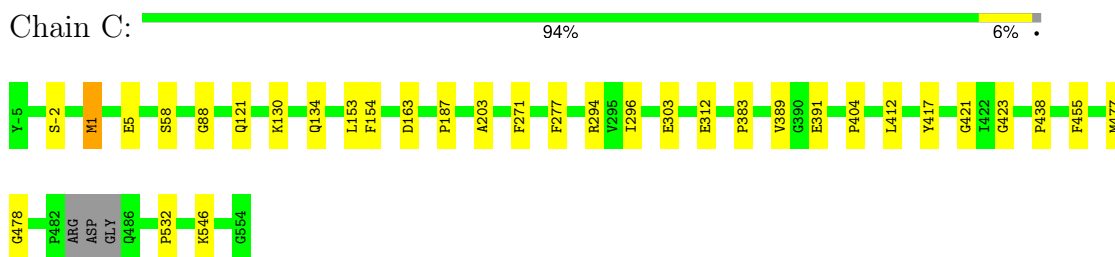
- Molecule 1: 2-Hydroxyacyl-CoA lyase/Synthase



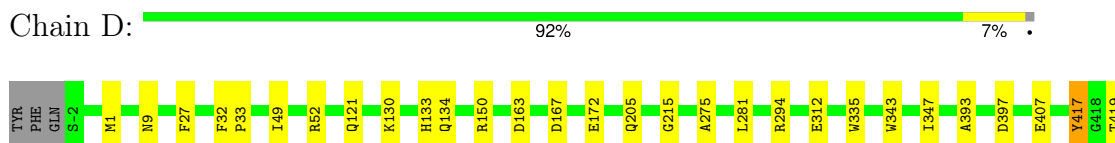
- Molecule 1: 2-Hydroxyacyl-CoA lyase/Synthase

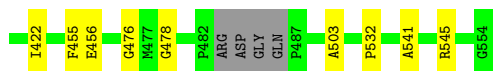


- Molecule 1: 2-Hydroxyacyl-CoA lyase/Synthase



- Molecule 1: 2-Hydroxyacyl-CoA lyase/Synthase





4 Data and refinement statistics

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, α , β , γ	69.41Å 102.68Å 104.34Å 114.10° 96.74° 105.23°	Depositor
Resolution (Å)	49.52 – 2.05 49.52 – 2.05	Depositor EDS
% Data completeness (in resolution range)	94.3 (49.52-2.05) 94.4 (49.52-2.05)	Depositor EDS
R_{merge}	0.19	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.23 (at 2.05Å)	Xtrriage
Refinement program	PHENIX 1.20.1_4487	Depositor
R, R_{free}	0.207 , 0.243 0.207 , 0.243	Depositor DCC
R_{free} test set	7057 reflections (4.88%)	wwPDB-VP
Wilson B-factor (Å ²)	25.4	Xtrriage
Anisotropy	0.126	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.36 , 27.6	EDS
L-test for twinning ²	$\langle L \rangle = 0.44$, $\langle L^2 \rangle = 0.27$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	17914	wwPDB-VP
Average B, all atoms (Å ²)	25.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 9.80% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: MG, ADP, UQ3, GOL, ACE, 8FL

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	0.28	0/4278	0.52	0/5809
1	B	0.28	0/4252	0.52	0/5773
1	C	0.28	0/4276	0.51	0/5807
1	D	0.28	0/4252	0.53	0/5773
All	All	0.28	0/17058	0.52	0/23162

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	4185	0	4151	17	0
1	B	4159	0	4130	14	0
1	C	4183	0	4143	14	0
1	D	4159	0	4130	23	0
2	A	27	0	0	1	0
2	B	27	0	0	1	0
2	C	27	0	0	0	0
2	D	27	0	0	2	0
3	A	50	0	0	1	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	B	50	0	0	0	0
3	C	50	0	0	0	0
3	D	50	0	0	0	0
4	A	27	0	12	0	0
4	B	27	0	12	0	0
4	C	27	0	12	0	0
4	D	27	0	12	0	0
5	A	3	0	3	0	0
5	B	3	0	3	0	0
5	C	6	0	6	0	0
6	A	1	0	0	0	0
6	B	1	0	0	0	0
6	C	1	0	0	0	0
6	D	1	0	0	0	0
7	B	6	0	8	0	0
8	A	199	0	0	0	0
8	B	204	0	0	1	0
8	C	185	0	0	0	0
8	D	202	0	0	1	0
All	All	17914	0	16622	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 2.

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:A:191:LEU:HD23	1:A:321:ALA:HB1	1.84	0.59
1:C:391:GLU:OE2	1:C:421:GLY:N	2.35	0.57
1:A:121:GLN:NE2	1:A:163:ASP:OD1	2.37	0.57
1:D:294:ARG:HD2	1:D:312:GLU:OE1	2.06	0.55
1:B:395:THR:HG23	1:B:470:LEU:HD22	1.88	0.55
1:A:294:ARG:HD2	1:A:312:GLU:OE1	2.07	0.54
1:B:134:GLN:HA	1:B:163:ASP:HB3	1.89	0.54
1:D:393:ALA:HB3	2:D:601:8FL:O3B	2.08	0.54
1:A:395:THR:HG23	1:A:470:LEU:HD22	1.90	0.53
1:C:121:GLN:NE2	1:C:163:ASP:OD1	2.43	0.51
1:B:150:ARG:NH1	1:C:303:GLU:O	2.45	0.49
1:B:205:GLN:HG2	1:B:335:TRP:CG	2.47	0.49
1:D:478:GLY:HA3	1:D:541:ALA:HB1	1.94	0.49
1:C:130:LYS:NZ	1:C:154:PHE:O	2.46	0.49

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:153:LEU:HG	1:A:187:PRO:HG3	1.94	0.48
1:A:364:ASP:OD1	1:A:366:THR:HG23	2.13	0.48
1:B:455:PHE:CZ	1:B:532:PRO:HB2	2.48	0.48
1:D:52:ARG:HH21	1:D:456:GLU:CD	2.16	0.48
1:A:205:GLN:HG2	1:A:335:TRP:CG	2.49	0.48
1:C:-2:SER:HB3	1:C:1:MET:SD	2.54	0.48
1:B:294:ARG:HD2	1:B:312:GLU:OE1	2.14	0.47
1:D:476:GLY:HA2	2:D:601:8FL:O3B	2.14	0.47
1:D:397:ASP:OD2	1:D:545:ARG:NH2	2.47	0.47
1:C:294:ARG:HD2	1:C:312:GLU:OE1	2.14	0.47
1:C:477:MET:HE2	1:C:478:GLY:O	2.15	0.47
1:A:78:SER:HB3	1:A:105:ALA:HA	1.97	0.46
1:A:261:SER:OG	3:A:602:UQ3:O51	2.29	0.46
1:D:27:PHE:CE2	1:D:49:ILE:HD12	2.50	0.46
1:D:121:GLN:NE2	1:D:163:ASP:OD1	2.48	0.46
1:A:455:PHE:CZ	1:A:532:PRO:HB2	2.51	0.46
1:D:167:ASP:OD1	1:D:167:ASP:N	2.49	0.45
1:B:393:ALA:HB3	2:B:602:8FL:O2B	2.17	0.45
1:D:407:GLU:HG3	8:D:868:HOH:O	2.15	0.45
1:D:134:GLN:HA	1:D:163:ASP:HB3	1.99	0.45
1:C:203:ALA:HB3	1:C:296:ILE:HD11	1.99	0.45
1:C:455:PHE:CZ	1:C:532:PRO:HB2	2.53	0.44
1:B:63:ALA:HB2	1:B:426:PHE:CD1	2.53	0.44
1:C:134:GLN:HA	1:C:163:ASP:HB3	1.98	0.44
1:C:153:LEU:HG	1:C:187:PRO:HG3	2.00	0.44
1:A:303:GLU:O	1:D:150:ARG:NH1	2.50	0.44
1:A:167:ASP:OD1	1:A:167:ASP:N	2.48	0.44
1:D:205:GLN:HG2	1:D:335:TRP:CG	2.53	0.43
1:D:215:GLY:HA3	1:D:275:ALA:HB2	2.00	0.43
1:A:315:LEU:HB3	1:A:322:ILE:HD13	2.01	0.43
1:B:205:GLN:HG2	1:B:335:TRP:CD2	2.53	0.43
1:D:455:PHE:CZ	1:D:532:PRO:HB2	2.54	0.43
1:A:134:GLN:HA	1:A:163:ASP:HB3	2.01	0.43
1:C:383:PRO:HG2	1:C:438:PRO:HG3	2.00	0.42
1:A:476:GLY:HA2	2:A:601:8FL:O1B	2.19	0.42
1:B:51:MET:HG3	1:B:57:ALA:HB2	2.01	0.42
1:C:389:VAL:HA	1:C:412:LEU:O	2.20	0.42
1:B:290:SER:HB2	8:B:755:HOH:O	2.20	0.42
1:D:32:PHE:HA	1:D:33:PRO:HA	1.89	0.42
1:D:281:LEU:HD23	1:D:281:LEU:HA	1.86	0.42
1:A:3:LYS:HD3	1:A:4:SER:N	2.35	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:343:TRP:CE2	1:D:347:ILE:HD11	2.56	0.41
1:B:384:ARG:HG2	1:B:406:PHE:CD2	2.55	0.41
1:D:455:PHE:CE1	1:D:503:ALA:HA	2.56	0.41
1:D:9:ASN:HB3	1:D:172:GLU:HG2	2.02	0.41
1:C:58:SER:HB2	1:C:88:GLY:HA3	2.01	0.41
1:D:422:ILE:H	1:D:422:ILE:HG13	1.71	0.40
1:B:228:ARG:CZ	1:B:249:PRO:HD3	2.51	0.40
1:D:417:TYR:HB3	1:D:419:THR:OG1	2.20	0.40
1:A:422:ILE:H	1:A:422:ILE:HG13	1.71	0.40
1:B:455:PHE:CE2	1:B:534:ILE:HG13	2.57	0.40
1:D:130:LYS:HE2	1:D:130:LYS:HB3	1.84	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	553/560 (99%)	543 (98%)	10 (2%)	0	100	100
1	B	550/560 (98%)	539 (98%)	11 (2%)	0	100	100
1	C	554/560 (99%)	542 (98%)	11 (2%)	1 (0%)	44	38
1	D	550/560 (98%)	538 (98%)	12 (2%)	0	100	100
All	All	2207/2240 (98%)	2162 (98%)	44 (2%)	1 (0%)	100	100

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	423	GLY

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	415/417 (100%)	409 (99%)	6 (1%)	62	63
1	B	412/417 (99%)	409 (99%)	3 (1%)	81	83
1	C	413/417 (99%)	406 (98%)	7 (2%)	56	55
1	D	412/417 (99%)	409 (99%)	3 (1%)	81	83
All	All	1652/1668 (99%)	1633 (99%)	19 (1%)	67	68

All (19) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	1	MET
1	A	43	ARG
1	A	55	GLN
1	A	235	ARG
1	A	271	PHE
1	A	417	TYR
1	B	1	MET
1	B	137	ARG
1	B	417	TYR
1	C	1	MET
1	C	5	GLU
1	C	271	PHE
1	C	277	PHE
1	C	404	PRO
1	C	417	TYR
1	C	546	LYS
1	D	1	MET
1	D	133	HIS
1	D	417	TYR

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

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 21 ligands modelled in this entry, 4 are monoatomic - leaving 17 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
4	ADP	D	603	-	24,29,29	0.91	1 (4%)	29,45,45	1.31	3 (10%)
3	UQ3	C	602	-	45,52,55	0.92	3 (6%)	56,77,82	1.13	1 (1%)
5	ACE	C	605	-	1,2,2	0.91	0	0,1,1	-	-
4	ADP	C	604	-	24,29,29	0.98	1 (4%)	29,45,45	1.42	3 (10%)
5	ACE	B	601	-	1,2,2	0.80	0	0,1,1	-	-
2	8FL	C	601	6	25,28,28	1.06	1 (4%)	32,42,42	0.91	1 (3%)
3	UQ3	D	602	-	45,52,55	0.92	2 (4%)	56,77,82	1.13	3 (5%)
4	ADP	A	603	-	24,29,29	0.96	1 (4%)	29,45,45	1.51	5 (17%)
3	UQ3	A	602	-	45,52,55	0.82	1 (2%)	56,77,82	1.19	3 (5%)
5	ACE	C	603	-	1,2,2	0.92	0	0,1,1	-	-
3	UQ3	B	603	-	45,52,55	0.88	1 (2%)	56,77,82	1.21	3 (5%)
5	ACE	A	604	-	1,2,2	0.86	0	0,1,1	-	-
7	GOL	B	605	-	5,5,5	0.89	0	5,5,5	1.11	0
2	8FL	A	601	6	25,28,28	0.99	1 (4%)	32,42,42	0.91	1 (3%)
4	ADP	B	604	-	24,29,29	0.92	1 (4%)	29,45,45	1.37	4 (13%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
2	8FL	D	601	6	25,28,28	0.97	1 (4%)	32,42,42	0.93	0
2	8FL	B	602	6	25,28,28	1.02	1 (4%)	32,42,42	0.91	2 (6%)

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
4	ADP	D	603	-	-	2/12/32/32	0/3/3/3
3	UQ3	C	602	-	-	6/45/66/71	0/3/3/3
4	ADP	C	604	-	-	2/12/32/32	0/3/3/3
2	8FL	C	601	6	1/1/6/6	3/17/33/33	0/2/2/2
3	UQ3	D	602	-	-	6/45/66/71	0/3/3/3
4	ADP	A	603	-	-	3/12/32/32	0/3/3/3
3	UQ3	A	602	-	-	4/45/66/71	0/3/3/3
3	UQ3	B	603	-	-	4/45/66/71	0/3/3/3
7	GOL	B	605	-	-	0/4/4/4	-
2	8FL	A	601	6	1/1/6/6	2/17/33/33	0/2/2/2
4	ADP	B	604	-	-	2/12/32/32	0/3/3/3
2	8FL	D	601	6	1/1/6/6	1/17/33/33	0/2/2/2
2	8FL	B	602	6	1/1/6/6	2/17/33/33	0/2/2/2

All (15) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	C	601	8FL	OC2-C2	-3.40	1.32	1.40
2	B	602	8FL	OC2-C2	-3.18	1.33	1.40
2	D	601	8FL	OC2-C2	-3.08	1.33	1.40
2	A	601	8FL	OC2-C2	-2.98	1.33	1.40
3	B	603	UQ3	C03-S05	-2.71	1.67	1.74
4	C	604	ADP	PA-O3A	2.60	1.62	1.59
3	D	602	UQ3	C03-S05	-2.57	1.67	1.74
3	C	602	UQ3	C03-S05	-2.54	1.67	1.74
4	A	603	ADP	PA-O3A	2.49	1.62	1.59
3	A	602	UQ3	C03-S05	-2.38	1.68	1.74
3	D	602	UQ3	P26-O25	2.35	1.62	1.59
3	C	602	UQ3	P22-O25	2.32	1.62	1.59
3	C	602	UQ3	P26-O25	2.12	1.61	1.59

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	B	604	ADP	C2-N3	2.03	1.35	1.32
4	D	603	ADP	C2-N3	2.03	1.35	1.32

All (29) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	B	603	UQ3	N43-C42-N41	-5.81	120.78	128.67
3	D	602	UQ3	N43-C42-N41	-5.51	121.19	128.67
3	A	602	UQ3	N43-C42-N41	-5.45	121.27	128.67
3	C	602	UQ3	N43-C42-N41	-5.33	121.44	128.67
4	A	603	ADP	N3-C2-N1	-3.98	123.26	128.67
4	C	604	ADP	N3-C2-N1	-3.76	123.56	128.67
4	B	604	ADP	N3-C2-N1	-3.58	123.82	128.67
4	D	603	ADP	N3-C2-N1	-3.51	123.91	128.67
3	B	603	UQ3	C06-C07-N08	-3.16	105.81	112.41
4	A	603	ADP	C4'-O4'-C1'	-3.14	107.05	109.92
4	B	604	ADP	C4-C5-N7	-2.97	106.20	109.34
4	A	603	ADP	C4-C5-N7	-2.88	106.29	109.34
4	C	604	ADP	C4-C5-N7	-2.84	106.33	109.34
4	C	604	ADP	C4'-O4'-C1'	-2.67	107.48	109.92
4	D	603	ADP	C4-C5-N7	-2.53	106.66	109.34
3	B	603	UQ3	C11-C09-N08	-2.44	111.90	116.34
3	D	602	UQ3	O21-C20-C17	-2.36	106.75	110.55
4	A	603	ADP	C1'-N9-C4	-2.36	122.50	126.64
3	A	602	UQ3	O35-C34-N36	-2.34	105.64	108.75
2	A	601	8FL	CM4-C4-N3	2.20	121.94	119.89
4	B	604	ADP	O3B-PB-O2B	2.19	116.02	107.80
2	B	602	8FL	CM4-C4-N3	2.10	121.85	119.89
4	B	604	ADP	C4'-O4'-C1'	-2.08	108.02	109.92
4	D	603	ADP	O3B-PB-O2B	2.08	115.59	107.80
2	B	602	8FL	C4-C5-S1	2.07	113.03	110.74
3	A	602	UQ3	C06-C07-N08	-2.06	108.10	112.41
4	A	603	ADP	O4'-C1'-N9	2.03	111.44	108.75
2	C	601	8FL	CM4-C4-N3	2.00	121.76	119.89
3	D	602	UQ3	C12-C11-C09	-2.00	109.06	112.39

All (4) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
2	A	601	8FL	C2
2	B	602	8FL	C2
2	C	601	8FL	C2

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Mol	Chain	Res	Type	Atom
2	D	601	8FL	C2

All (37) torsion outliers are listed below:

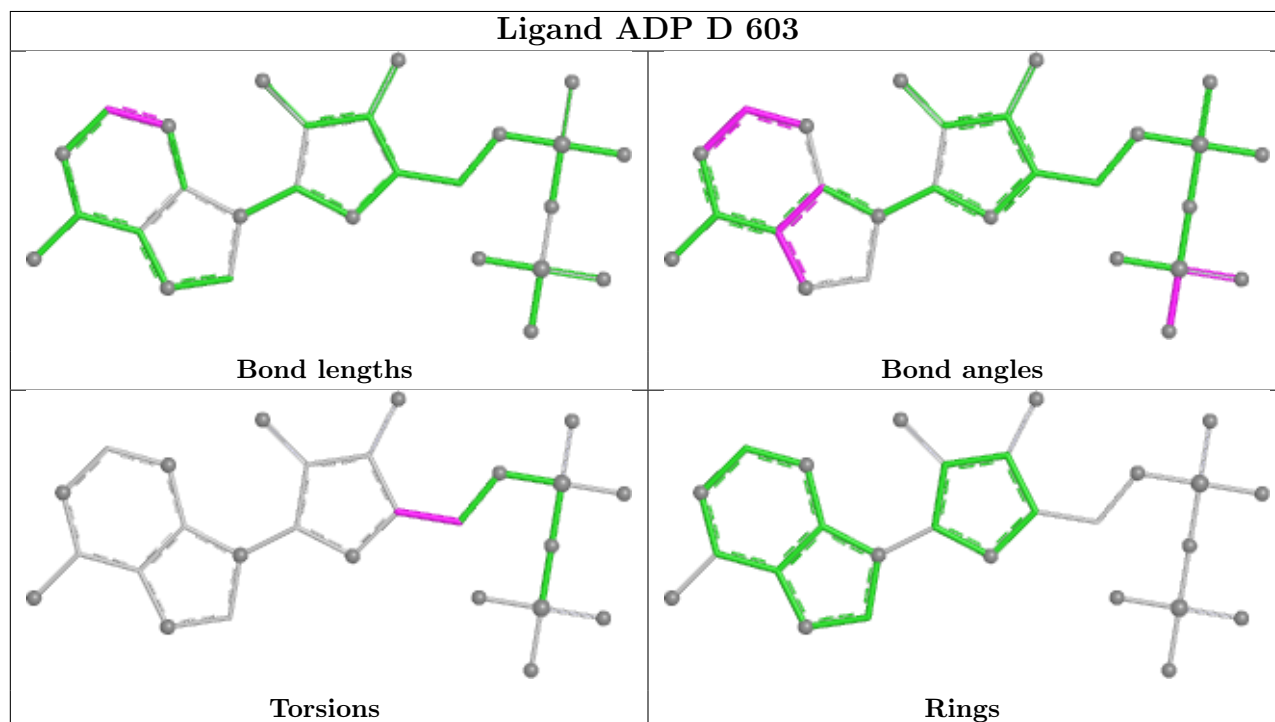
Mol	Chain	Res	Type	Atoms
2	A	601	8FL	PA-O3A-PB-O3B
2	A	601	8FL	PA-O3A-PB-O2B
2	B	602	8FL	PA-O3A-PB-O3B
2	C	601	8FL	PA-O3A-PB-O2B
3	A	602	UQ3	S05-C06-C07-N08
3	A	602	UQ3	C09-C11-C12-N13
3	A	602	UQ3	C20-O21-P22-O25
3	B	603	UQ3	S05-C06-C07-N08
3	B	603	UQ3	C09-C11-C12-N13
3	D	602	UQ3	S05-C06-C07-N08
3	D	602	UQ3	C09-C11-C12-N13
3	D	602	UQ3	C20-O21-P22-O24
3	D	602	UQ3	C20-O21-P22-O25
4	A	603	ADP	O4'-C4'-C5'-O5'
4	D	603	ADP	O4'-C4'-C5'-O5'
4	A	603	ADP	C3'-C4'-C5'-O5'
4	B	604	ADP	O4'-C4'-C5'-O5'
4	B	604	ADP	C3'-C4'-C5'-O5'
4	D	603	ADP	C3'-C4'-C5'-O5'
4	C	604	ADP	O4'-C4'-C5'-O5'
3	C	602	UQ3	P26-O25-P22-O23
4	C	604	ADP	C3'-C4'-C5'-O5'
3	C	602	UQ3	C07-C06-S05-C03
2	D	601	8FL	PB-O3A-PA-O7
3	A	602	UQ3	P22-O25-P26-O27
3	B	603	UQ3	P22-O25-P26-O27
3	D	602	UQ3	P22-O25-P26-O27
3	C	602	UQ3	C09-C11-C12-N13
3	C	602	UQ3	P22-O25-P26-O27
2	C	601	8FL	PA-O3A-PB-O1B
2	B	602	8FL	PA-O3A-PB-O2B
2	C	601	8FL	PA-O3A-PB-O3B
3	B	603	UQ3	P22-O25-P26-O28
3	C	602	UQ3	P26-O25-P22-O24
3	C	602	UQ3	P22-O25-P26-O28
3	D	602	UQ3	P22-O25-P26-O28
4	A	603	ADP	PB-O3A-PA-O1A

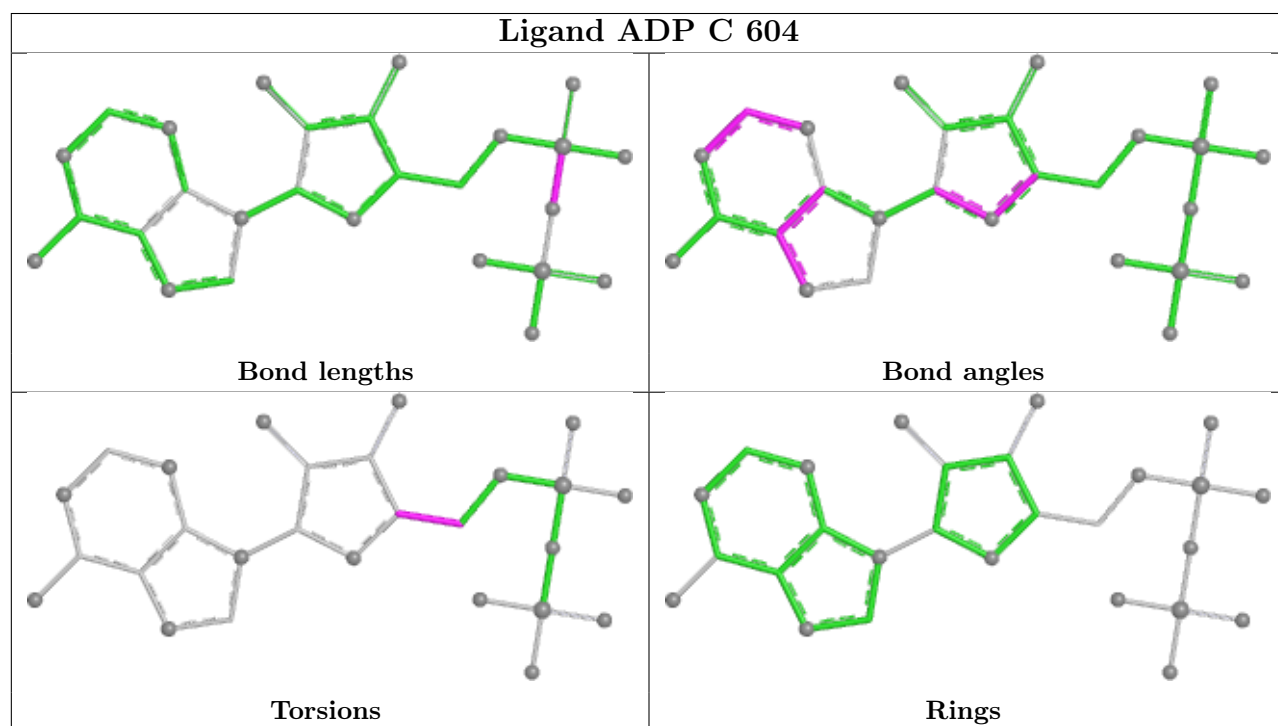
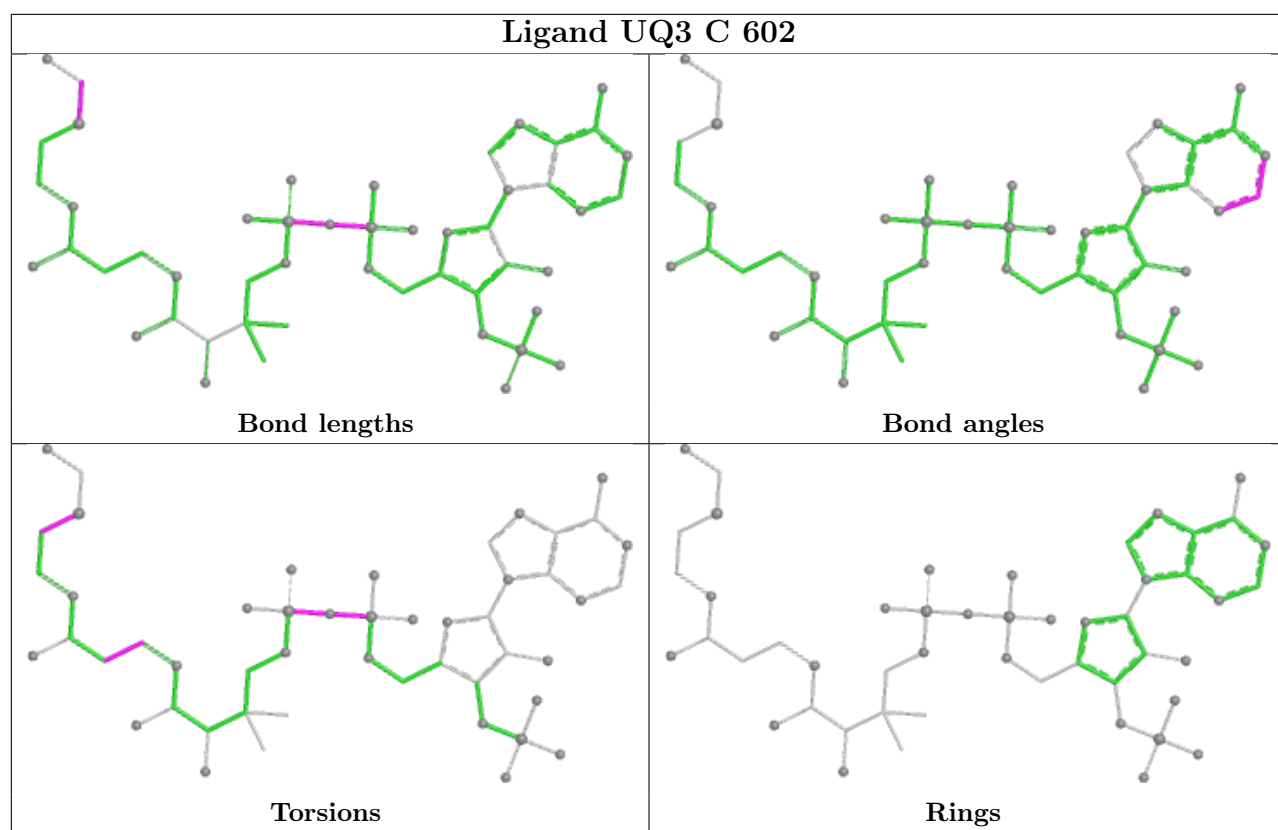
There are no ring outliers.

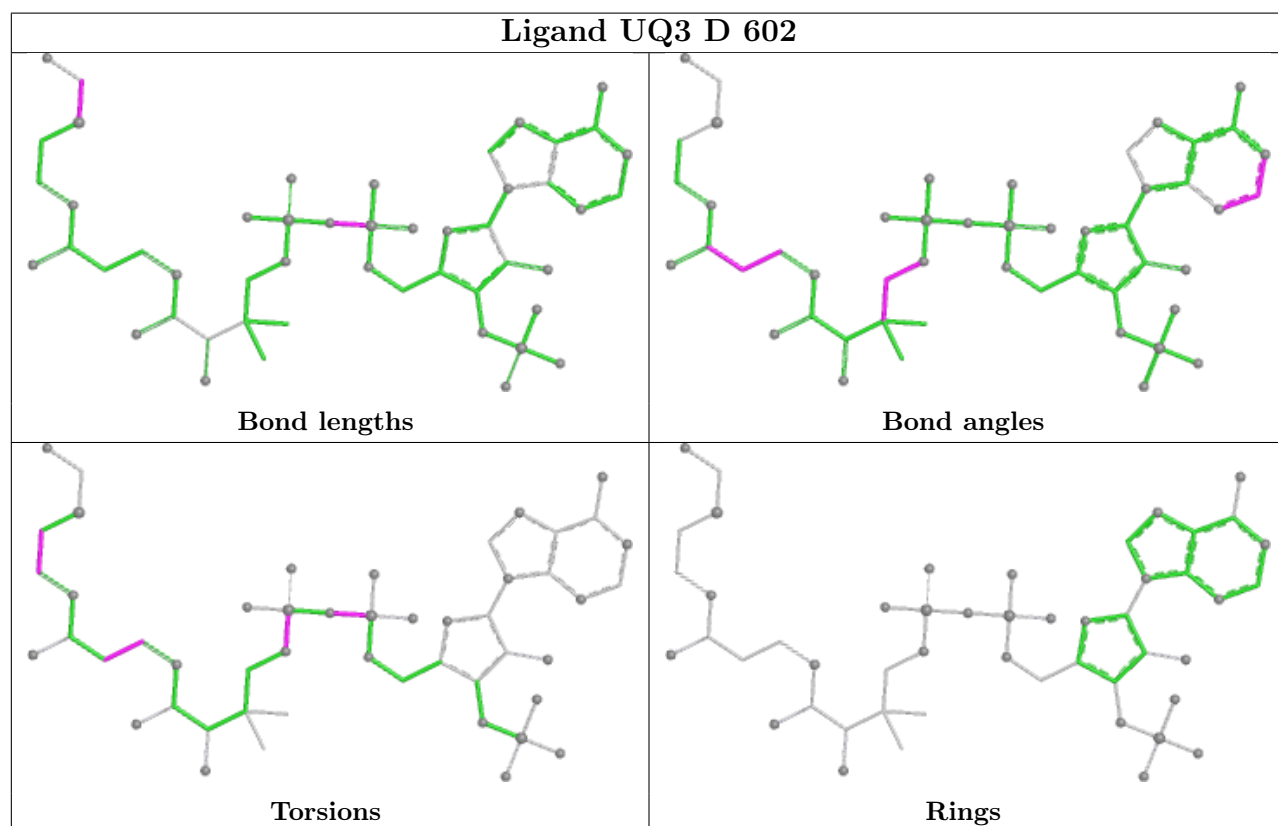
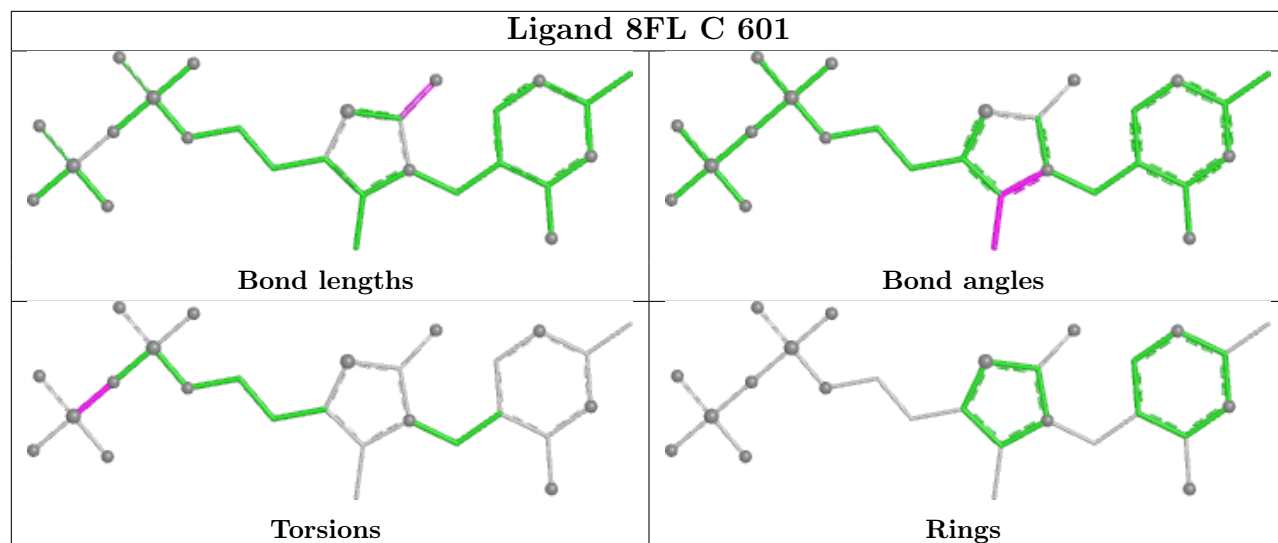
4 monomers are involved in 5 short contacts:

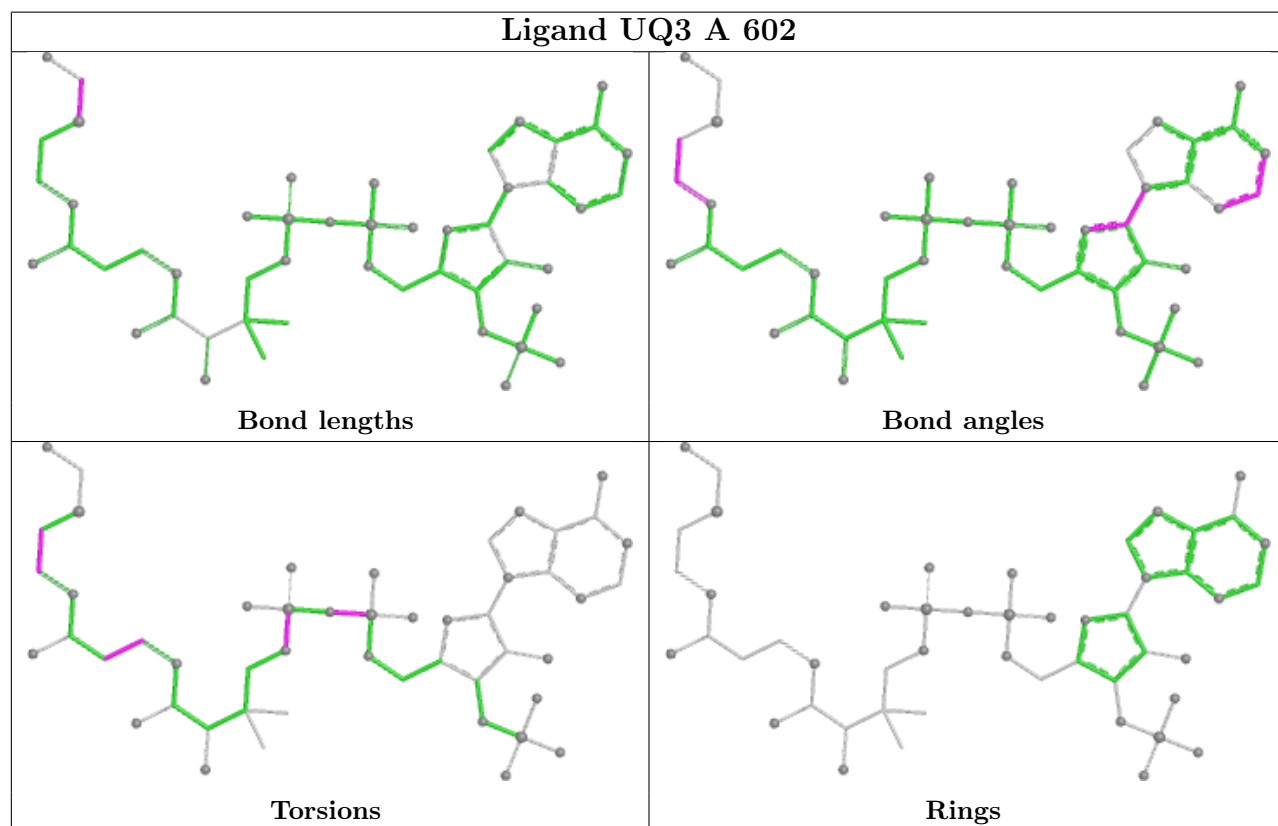
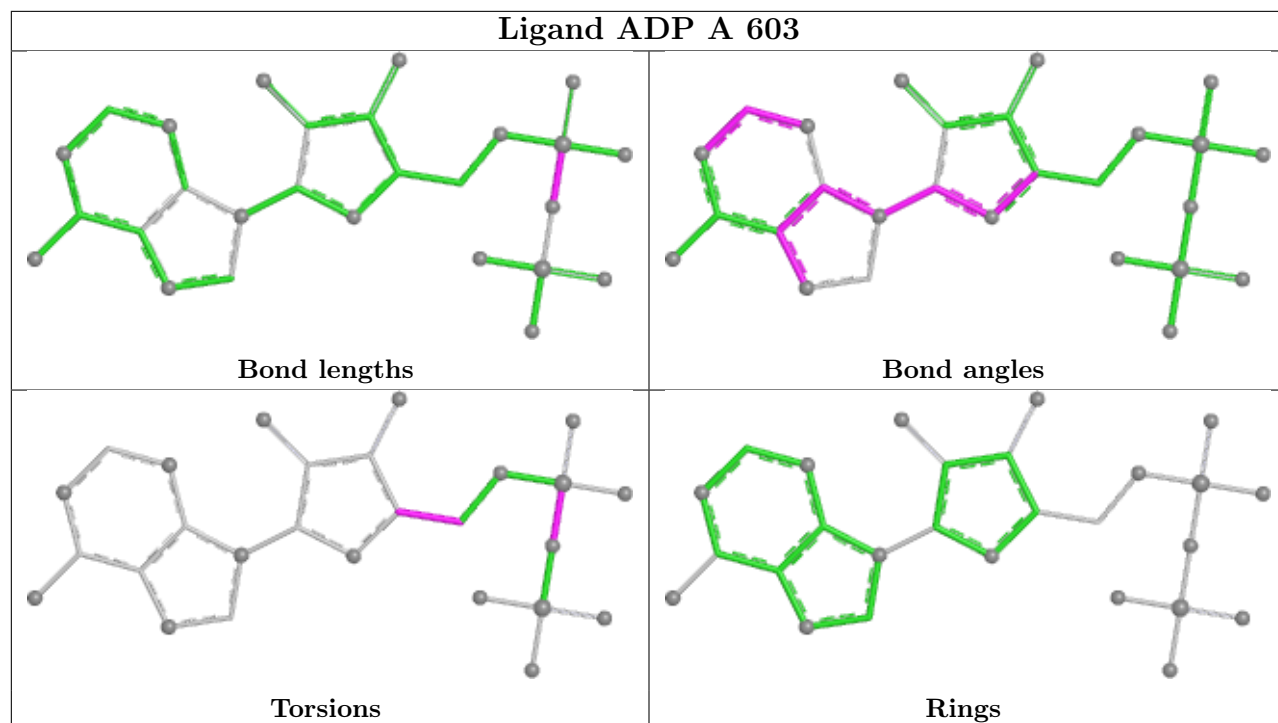
Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	602	UQ3	1	0
2	A	601	8FL	1	0
2	D	601	8FL	2	0
2	B	602	8FL	1	0

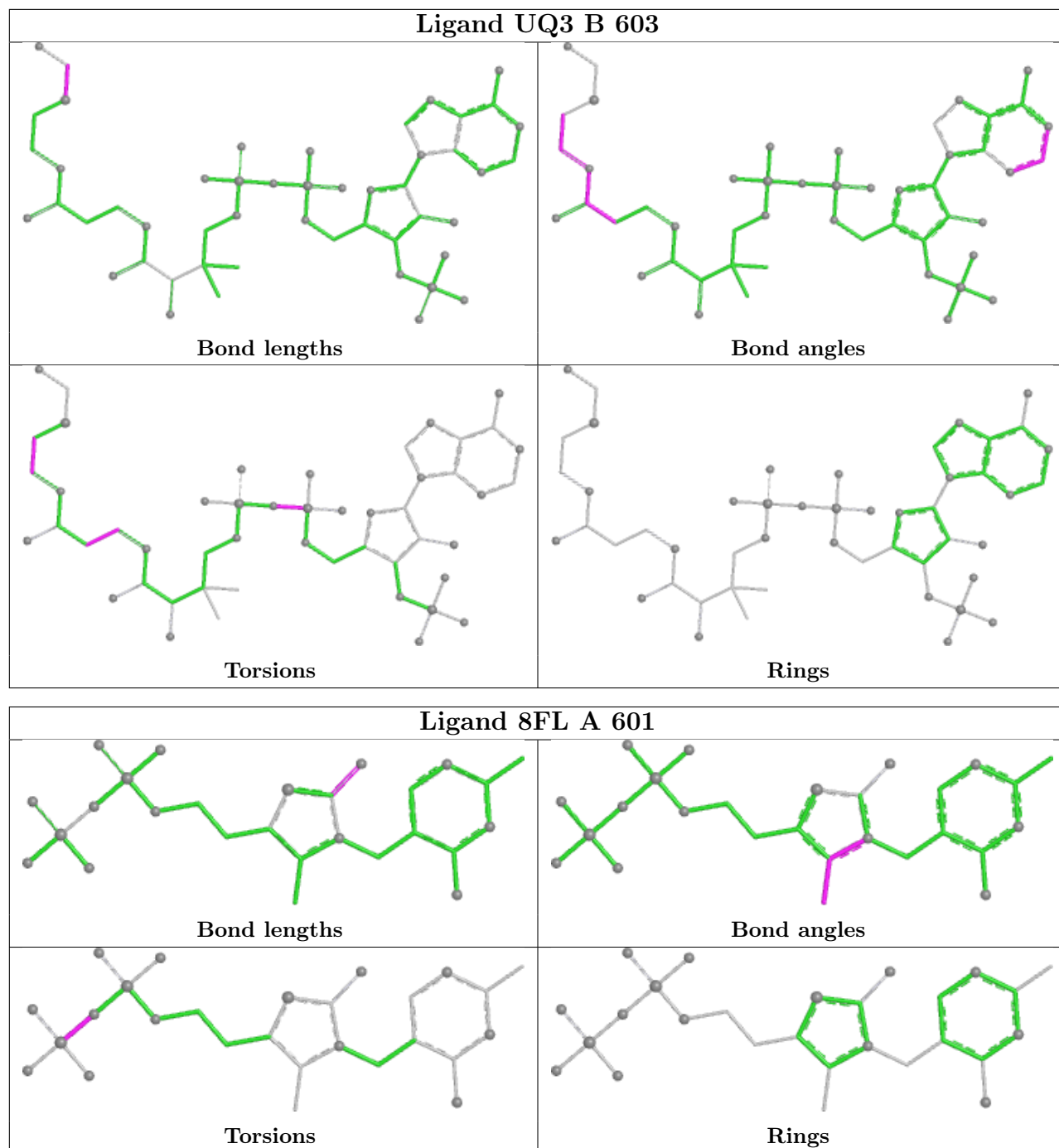
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included.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

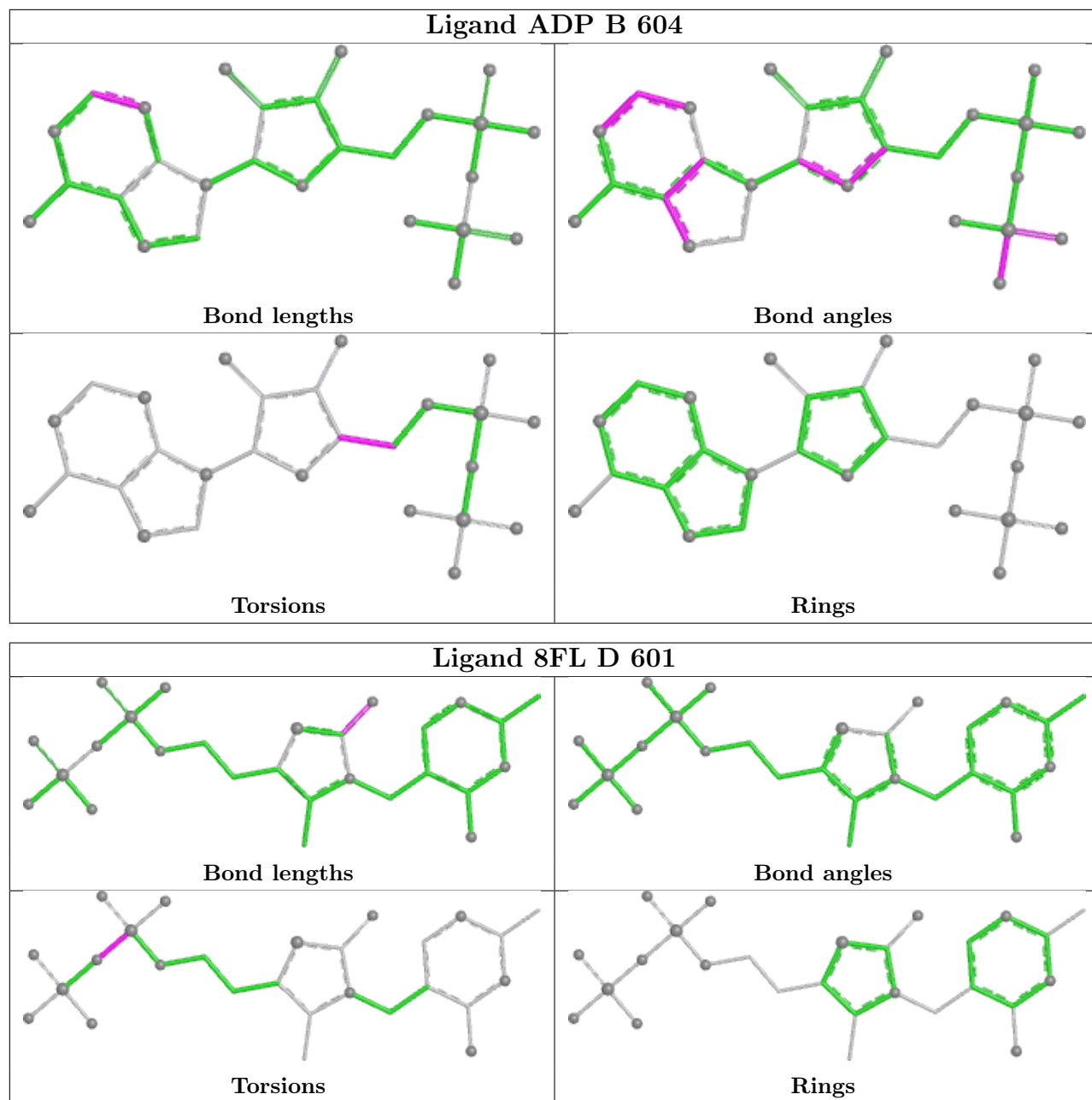


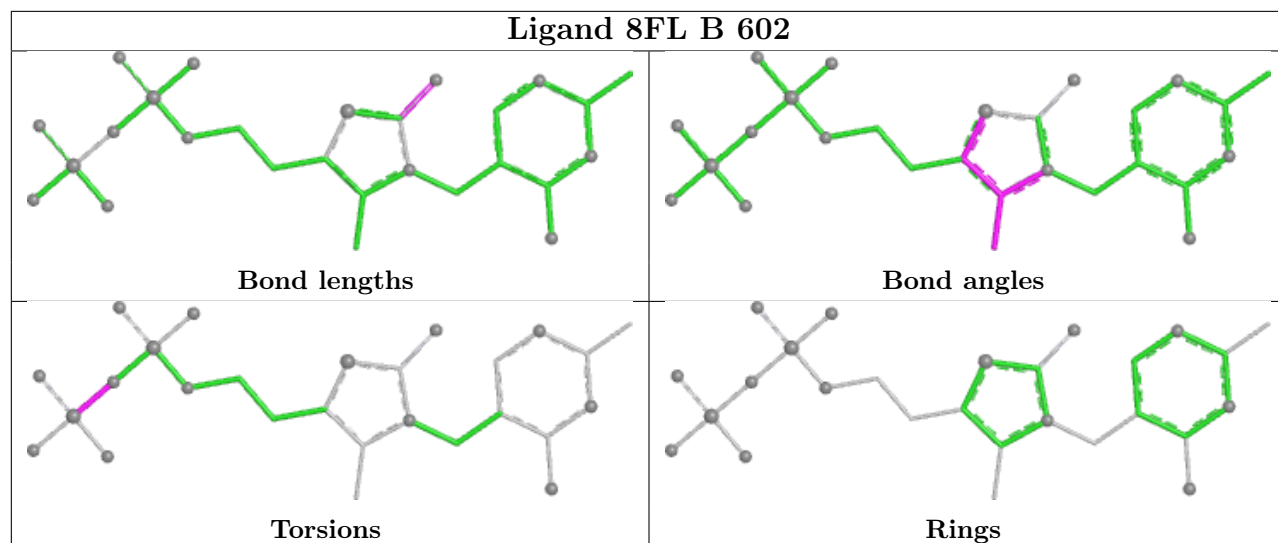












5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

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

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

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

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	554/560 (98%)	-1.44	0 100 100	12, 24, 38, 77	3 (0%)
1	B	553/560 (98%)	-1.45	0 100 100	13, 23, 34, 59	1 (0%)
1	C	557/560 (99%)	-1.44	0 100 100	12, 25, 41, 70	1 (0%)
1	D	553/560 (98%)	-1.45	0 100 100	13, 24, 37, 63	1 (0%)
All	All	2217/2240 (98%)	-1.44	0 100 100	12, 24, 38, 77	6 (0%)

There are no RSRZ outliers to report.

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
5	ACE	C	605	3/3	0.96	0.10	33,33,35,36	0
5	ACE	C	603	3/3	0.98	0.12	35,35,37,41	0
5	ACE	A	604	3/3	0.98	0.08	32,32,34,38	0
7	GOL	B	605	6/6	0.98	0.04	28,30,34,35	0

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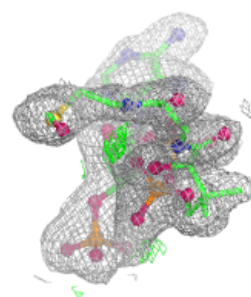
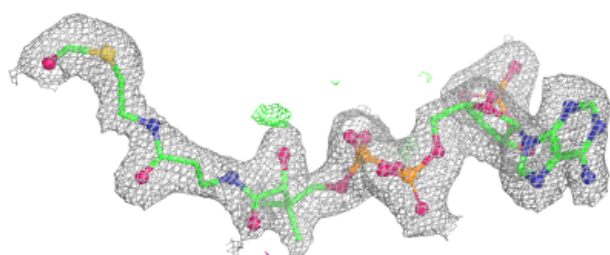
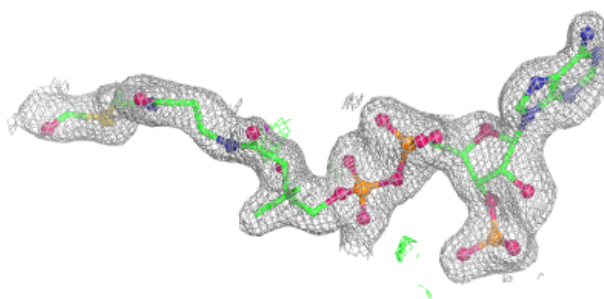
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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
3	UQ3	D	602	50/53	0.99	0.03	18,25,34,42	0
4	ADP	A	603	27/27	0.99	0.02	20,24,26,27	0
4	ADP	B	604	27/27	0.99	0.03	19,24,27,27	0
4	ADP	C	604	27/27	0.99	0.03	20,23,26,27	0
4	ADP	D	603	27/27	0.99	0.03	17,25,27,28	0
2	8FL	A	601	27/27	0.99	0.03	16,20,24,27	0
5	ACE	B	601	3/3	0.99	0.07	29,29,36,37	0
3	UQ3	A	602	50/53	0.99	0.03	16,24,29,39	0
3	UQ3	B	603	50/53	0.99	0.03	17,23,31,36	0
3	UQ3	C	602	50/53	0.99	0.03	17,25,33,43	0
2	8FL	C	601	27/27	1.00	0.02	18,20,23,25	0
2	8FL	D	601	27/27	1.00	0.03	18,22,26,27	0
6	MG	A	605	1/1	1.00	0.01	21,21,21,21	0
6	MG	B	606	1/1	1.00	0.01	16,16,16,16	0
6	MG	C	606	1/1	1.00	0.01	19,19,19,19	0
6	MG	D	604	1/1	1.00	0.02	20,20,20,20	0
2	8FL	B	602	27/27	1.00	0.02	17,20,22,26	0

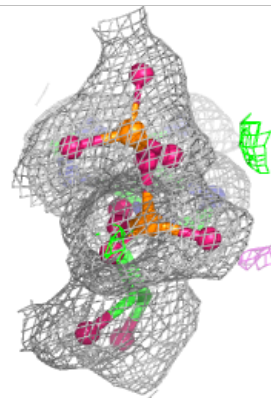
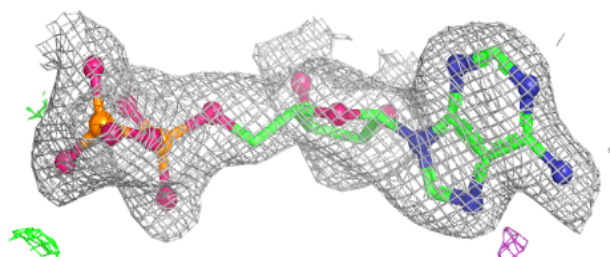
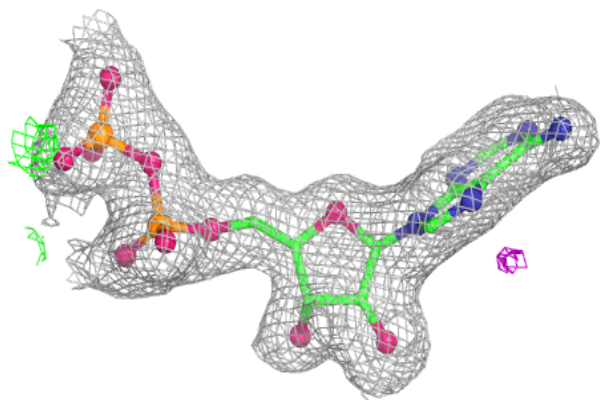
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.

Electron density around UQ3 D 602:

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

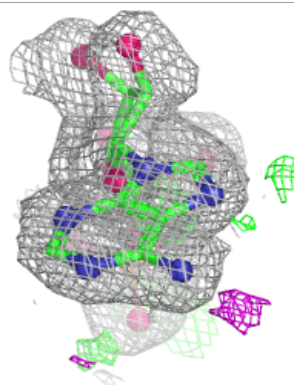
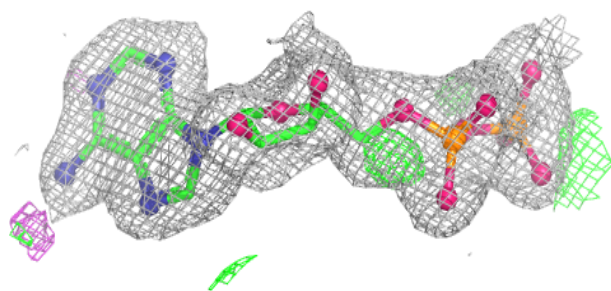
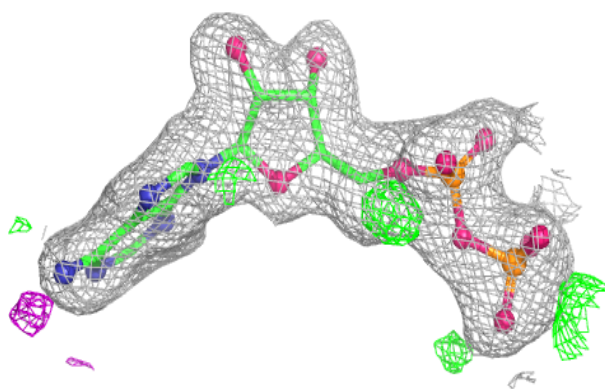
**Electron density around ADP A 603:**

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

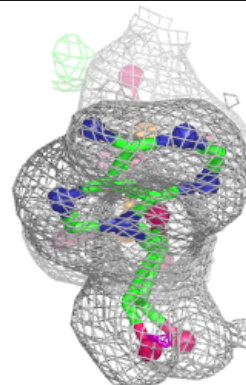
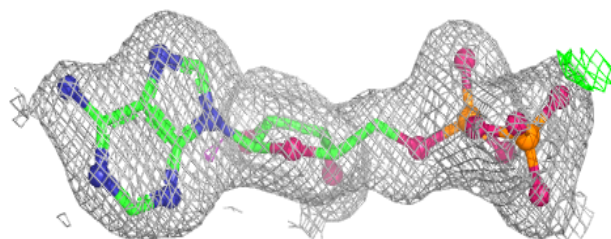
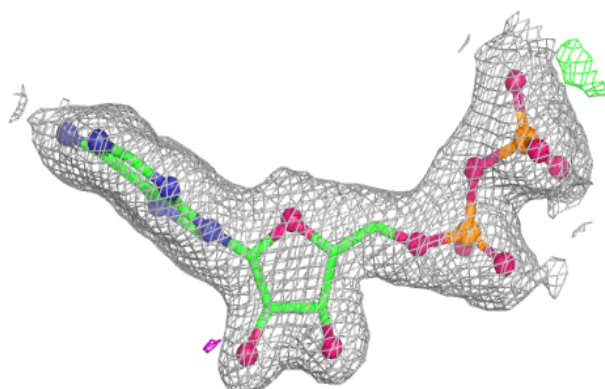


Electron density around ADP B 604:

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

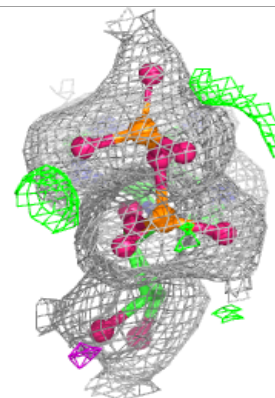
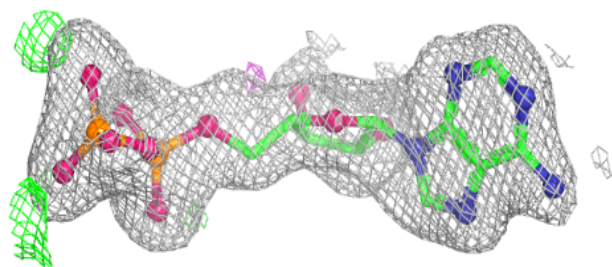
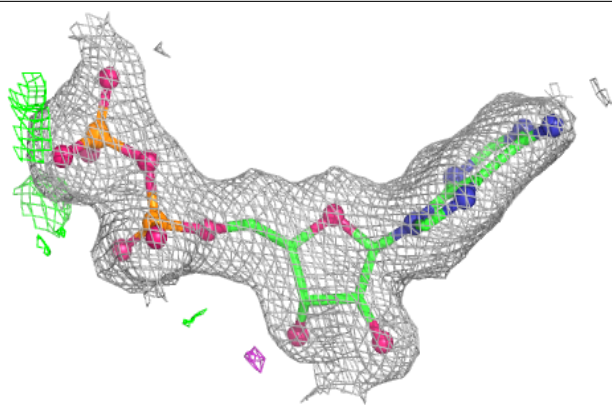
**Electron density around ADP C 604:**

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

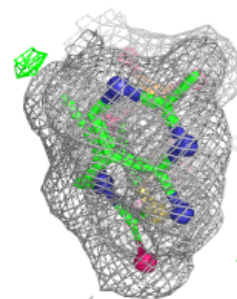
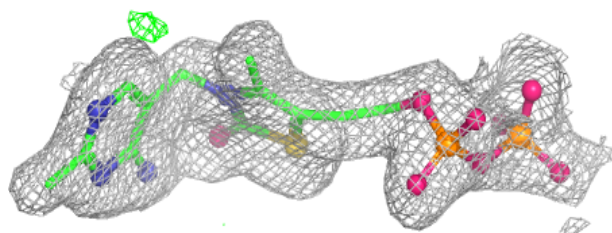
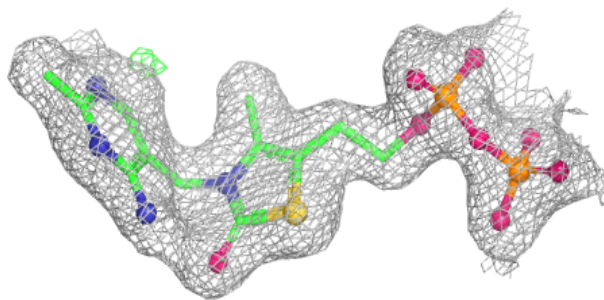


Electron density around ADP D 603:

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

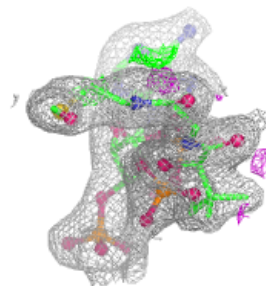
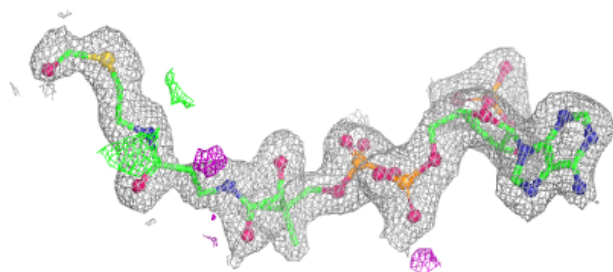
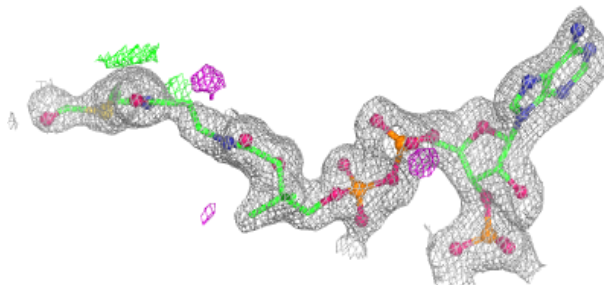
**Electron density around 8FL A 601:**

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

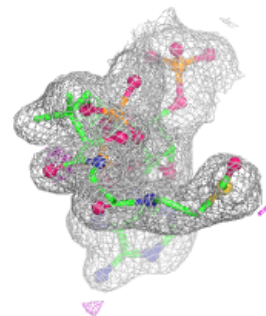
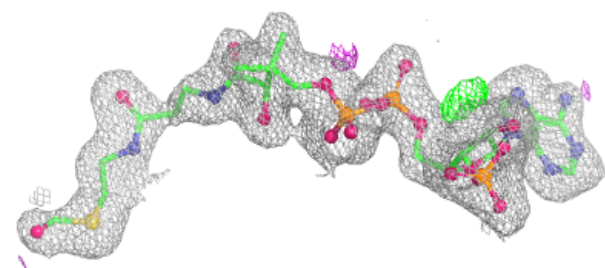
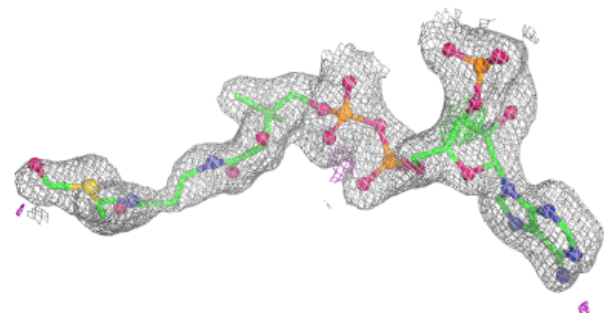


Electron density around UQ3 A 602:

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

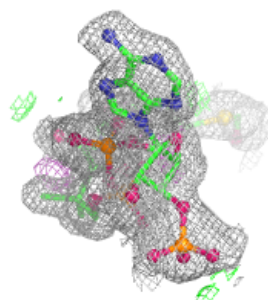
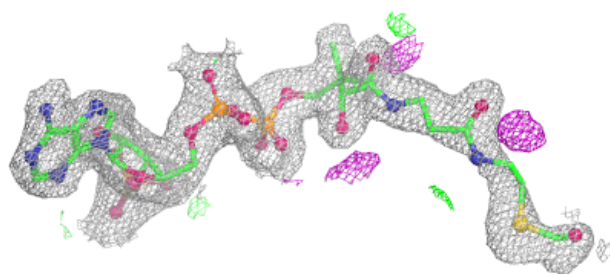
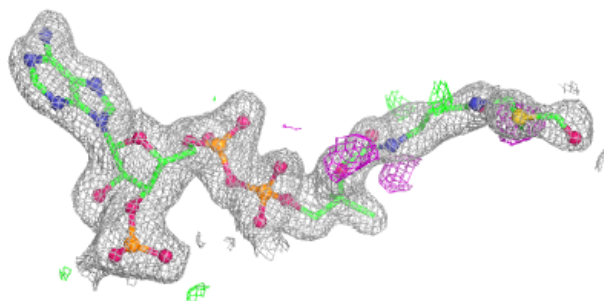
**Electron density around UQ3 B 603:**

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

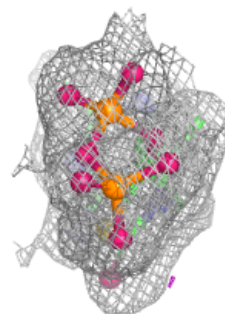
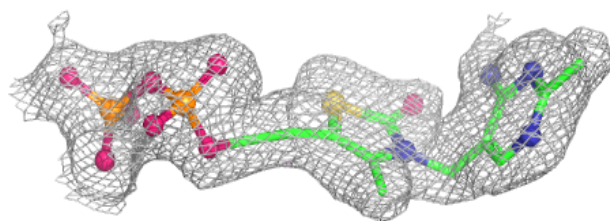
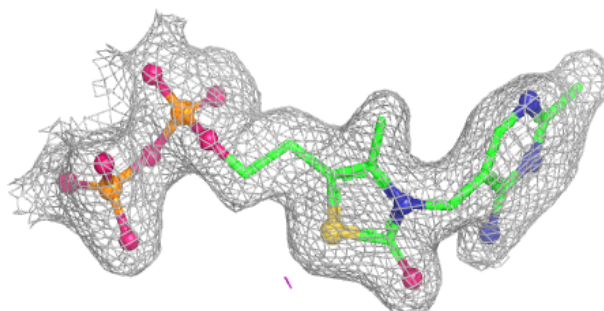


Electron density around UQ3 C 602:

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

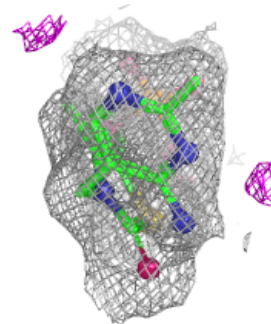
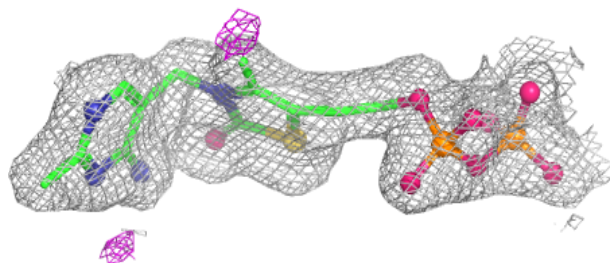
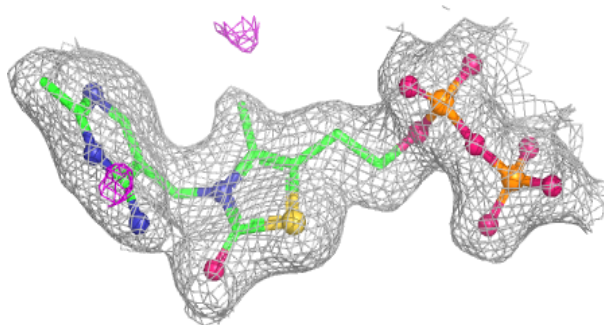
**Electron density around 8FL C 601:**

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

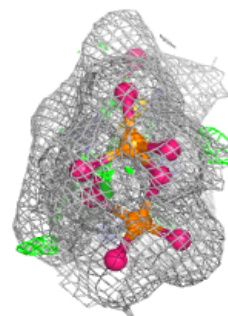
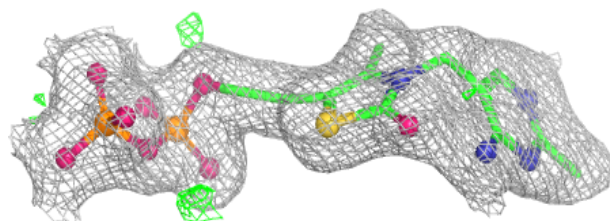
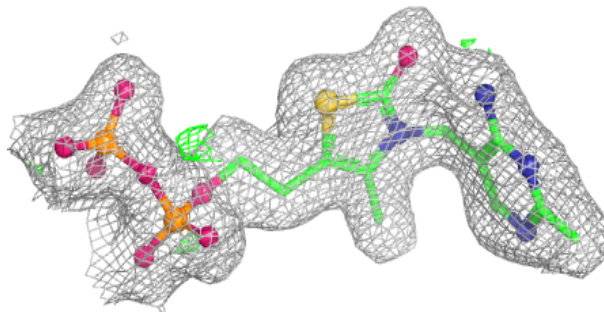


Electron density around 8FL D 601:

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

**Electron density around 8FL B 602:**

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



6.5 Other polymers [i](#)

There are no such residues in this entry.