



Full wwPDB X-ray Structure Validation Report ⓘ

Aug 26, 2024 – 10:22 AM EDT

PDB ID : 8VHR
Title : Crystal structure of E. coli class Ia ribonucleotide reductase alpha subunit W28A variant bound to dATP and GTP
Authors : Funk, M.A.; Zimanyi, C.M.; Drennan, C.L.
Deposited on : 2024-01-02
Resolution : 3.55 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 ⓘ](#)) 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

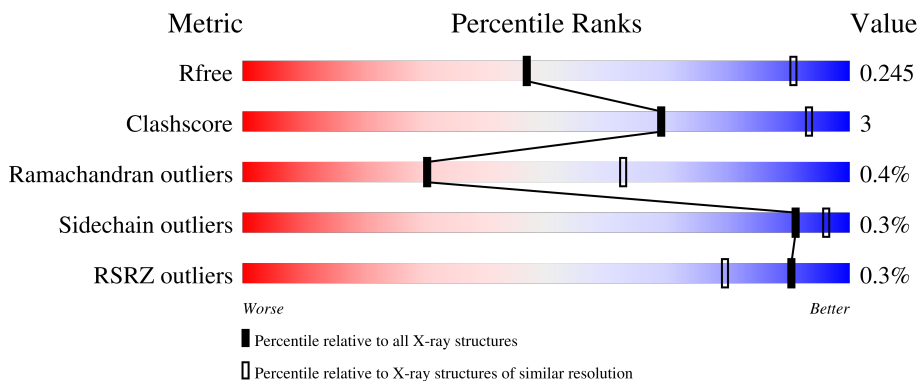
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION





The reported resolution of this entry is 3.55 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	1261 (3.62-3.50)
Clashscore	180529	1351 (3.62-3.50)
Ramachandran outliers	177936	1336 (3.62-3.50)
Sidechain outliers	177891	1337 (3.62-3.50)
RSRZ outliers	164620	1260 (3.62-3.50)

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 $\leq 5\%$. 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	779	 85% 9% 6%
1	B	779	 86% 8% 6%
1	C	779	 83% 10% 6%
1	D	779	 84% 10% 6%

2 Entry composition [i](#)

There are 4 unique types of molecules in this entry. The entry contains 23688 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 Ribonucleoside-diphosphate reductase 1 subunit alpha.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	733	5832	3702	1002	1104	24	0	0	0
1	B	732	5824	3698	1000	1102	24	0	0	0
1	C	733	5832	3702	1002	1104	24	0	0	0
1	D	732	5824	3698	1000	1102	24	0	0	0

There are 80 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-18	MET	-	initiating methionine	UNP P00452
A	-17	GLY	-	expression tag	UNP P00452
A	-16	SER	-	expression tag	UNP P00452
A	-15	SER	-	expression tag	UNP P00452
A	-14	HIS	-	expression tag	UNP P00452
A	-13	HIS	-	expression tag	UNP P00452
A	-12	HIS	-	expression tag	UNP P00452
A	-11	HIS	-	expression tag	UNP P00452
A	-10	HIS	-	expression tag	UNP P00452
A	-9	HIS	-	expression tag	UNP P00452
A	-8	SER	-	expression tag	UNP P00452
A	-7	SER	-	expression tag	UNP P00452
A	-6	GLY	-	expression tag	UNP P00452
A	-5	LEU	-	expression tag	UNP P00452
A	-4	VAL	-	expression tag	UNP P00452
A	-3	PRO	-	expression tag	UNP P00452
A	-2	ARG	-	expression tag	UNP P00452
A	-1	GLY	-	expression tag	UNP P00452
A	0	SER	-	expression tag	UNP P00452
A	28	ALA	TRP	engineered mutation	UNP P00452
B	-18	MET	-	initiating methionine	UNP P00452

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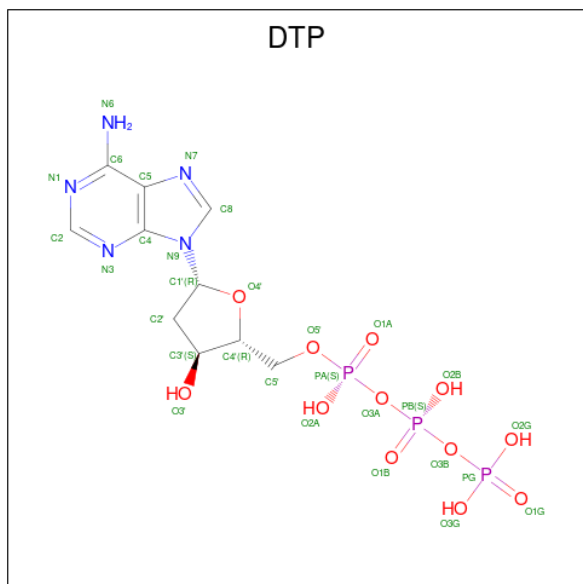
Chain	Residue	Modelled	Actual	Comment	Reference
B	-17	GLY	-	expression tag	UNP P00452
B	-16	SER	-	expression tag	UNP P00452
B	-15	SER	-	expression tag	UNP P00452
B	-14	HIS	-	expression tag	UNP P00452
B	-13	HIS	-	expression tag	UNP P00452
B	-12	HIS	-	expression tag	UNP P00452
B	-11	HIS	-	expression tag	UNP P00452
B	-10	HIS	-	expression tag	UNP P00452
B	-9	HIS	-	expression tag	UNP P00452
B	-8	SER	-	expression tag	UNP P00452
B	-7	SER	-	expression tag	UNP P00452
B	-6	GLY	-	expression tag	UNP P00452
B	-5	LEU	-	expression tag	UNP P00452
B	-4	VAL	-	expression tag	UNP P00452
B	-3	PRO	-	expression tag	UNP P00452
B	-2	ARG	-	expression tag	UNP P00452
B	-1	GLY	-	expression tag	UNP P00452
B	0	SER	-	expression tag	UNP P00452
B	28	ALA	TRP	engineered mutation	UNP P00452
C	-18	MET	-	initiating methionine	UNP P00452
C	-17	GLY	-	expression tag	UNP P00452
C	-16	SER	-	expression tag	UNP P00452
C	-15	SER	-	expression tag	UNP P00452
C	-14	HIS	-	expression tag	UNP P00452
C	-13	HIS	-	expression tag	UNP P00452
C	-12	HIS	-	expression tag	UNP P00452
C	-11	HIS	-	expression tag	UNP P00452
C	-10	HIS	-	expression tag	UNP P00452
C	-9	HIS	-	expression tag	UNP P00452
C	-8	SER	-	expression tag	UNP P00452
C	-7	SER	-	expression tag	UNP P00452
C	-6	GLY	-	expression tag	UNP P00452
C	-5	LEU	-	expression tag	UNP P00452
C	-4	VAL	-	expression tag	UNP P00452
C	-3	PRO	-	expression tag	UNP P00452
C	-2	ARG	-	expression tag	UNP P00452
C	-1	GLY	-	expression tag	UNP P00452
C	0	SER	-	expression tag	UNP P00452
C	28	ALA	TRP	engineered mutation	UNP P00452
D	-18	MET	-	initiating methionine	UNP P00452
D	-17	GLY	-	expression tag	UNP P00452
D	-16	SER	-	expression tag	UNP P00452

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Chain	Residue	Modelled	Actual	Comment	Reference
D	-15	SER	-	expression tag	UNP P00452
D	-14	HIS	-	expression tag	UNP P00452
D	-13	HIS	-	expression tag	UNP P00452
D	-12	HIS	-	expression tag	UNP P00452
D	-11	HIS	-	expression tag	UNP P00452
D	-10	HIS	-	expression tag	UNP P00452
D	-9	HIS	-	expression tag	UNP P00452
D	-8	SER	-	expression tag	UNP P00452
D	-7	SER	-	expression tag	UNP P00452
D	-6	GLY	-	expression tag	UNP P00452
D	-5	LEU	-	expression tag	UNP P00452
D	-4	VAL	-	expression tag	UNP P00452
D	-3	PRO	-	expression tag	UNP P00452
D	-2	ARG	-	expression tag	UNP P00452
D	-1	GLY	-	expression tag	UNP P00452
D	0	SER	-	expression tag	UNP P00452
D	28	ALA	TRP	engineered mutation	UNP P00452

- Molecule 2 is 2'-DEOXYADENOSINE 5'-TRIPHOSPHATE (three-letter code: DTP) (formula: $C_{10}H_{16}N_5O_{12}P_3$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	
			Total	C	N	O			P
2	A	1	30	10	5	12	3	0	0
2	A	1	30	10	5	12	3	0	0

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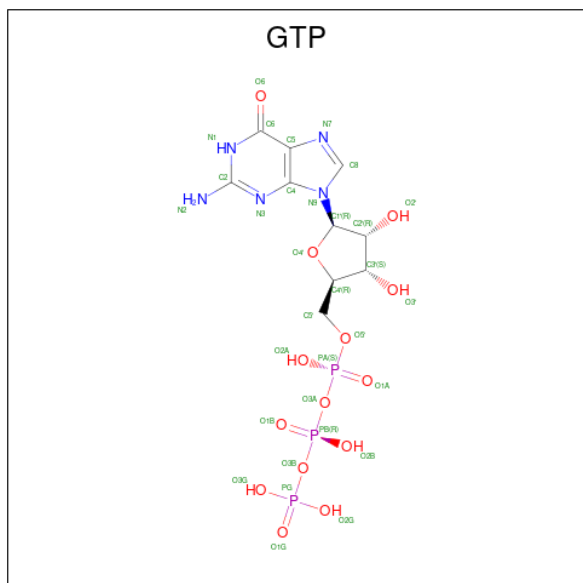
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Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	P		
2	B	1	Total 30	C 10	N 5	O 12	P 3	0	0
2	B	1	Total 30	C 10	N 5	O 12	P 3	0	0
2	C	1	Total 30	C 10	N 5	O 12	P 3	0	0
2	C	1	Total 30	C 10	N 5	O 12	P 3	0	0
2	D	1	Total 30	C 10	N 5	O 12	P 3	0	0
2	D	1	Total 30	C 10	N 5	O 12	P 3	0	0

- Molecule 3 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	Mg		
3	A	2	Total 2	Mg 2	0	0
3	B	2	Total 2	Mg 2	0	0
3	C	2	Total 2	Mg 2	0	0
3	D	2	Total 2	Mg 2	0	0

- Molecule 4 is GUANOSINE-5'-TRIPHOSPHATE (three-letter code: GTP) (formula: C₁₀H₁₆N₅O₁₄P₃) (labeled as "Ligand of Interest" by depositor).




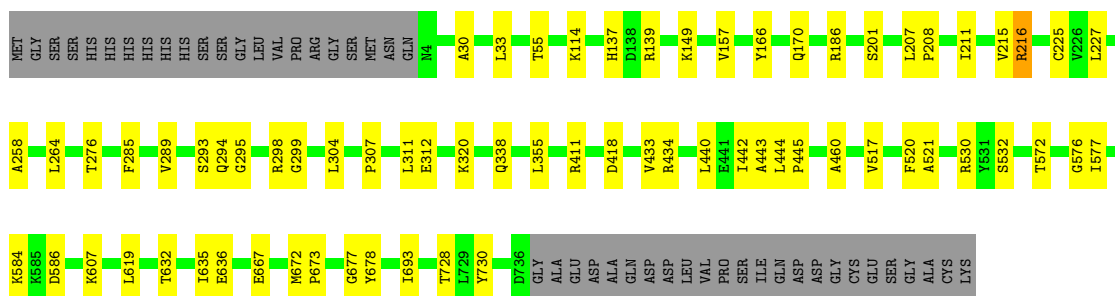
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
4	A	1	Total 32	C 10	N 5	O 14	P 3	0	0
4	B	1	Total 32	C 10	N 5	O 14	P 3	0	0
4	C	1	Total 32	C 10	N 5	O 14	P 3	0	0
4	D	1	Total 32	C 10	N 5	O 14	P 3	0	0

3 Residue-property plots


These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red dot above a residue indicates a poor fit to the electron density ($RSRZ > 2$). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

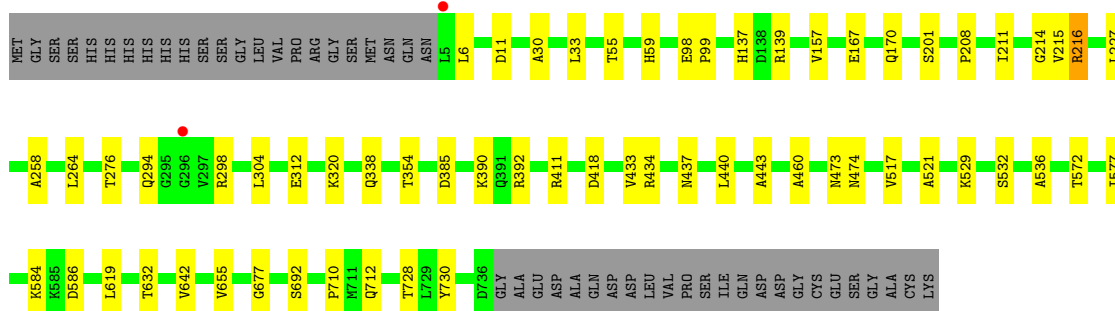
- Molecule 1: Ribonucleoside-diphosphate reductase 1 subunit alpha

Chain A: 




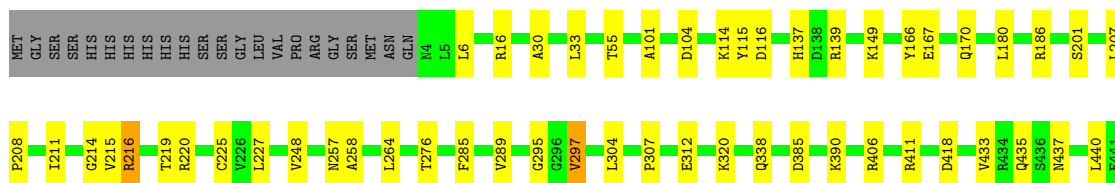
- Molecule 1: Ribonucleoside-diphosphate reductase 1 subunit alpha

Chain B: 



- Molecule 1: Ribonucleoside-diphosphate reductase 1 subunit alpha

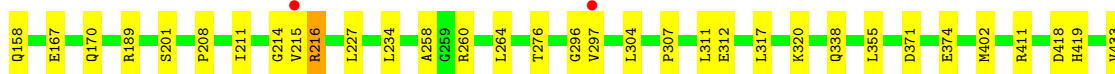
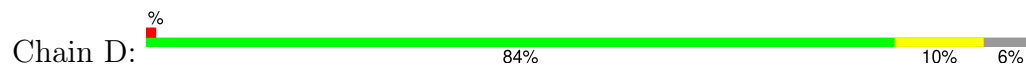
Chain C: 





ALA
GLU
ASP
SER
ALA
GLN
ASP
ASP
LEU
VAL
PRO
SER
SER
ILE
GLN
ASP
ASP
GLY
CYS
GLU
SER
GLY
ALA
CYS
LYS

• Molecule 1: Ribonucleoside-diphosphate reductase 1 subunit alpha



GLY
ALA
GLU
ASP
ALA
GLN
ASP
ASP
LEU
VAL
PRO
SER
SER
ILE
GLN
ASP
ASP
GLY
CYS
GLU
SER
GLY
ALA
CYS
LYS

4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	113.58Å 141.08Å 301.88Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	49.87 – 3.55 49.87 – 3.55	Depositor EDS
% Data completeness (in resolution range)	95.3 (49.87-3.55) 95.2 (49.87-3.55)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.79 (at 3.57Å)	Xtrriage
Refinement program	PHENIX 1.9_1692	Depositor
R, R_{free}	0.197 , 0.243 0.205 , 0.245	Depositor DCC
R_{free} test set	53474 reflections (9.96%)	wwPDB-VP
Wilson B-factor (Å ²)	131.5	Xtrriage
Anisotropy	0.245	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.29 , 92.0	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	23688	wwPDB-VP
Average B, all atoms (Å ²)	154.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.77% 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: DTP, MG, GTP

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	0.21	0/5958	0.36	0/8069
1	B	0.20	0/5950	0.35	0/8058
1	C	0.20	0/5958	0.36	0/8069
1	D	0.20	0/5950	0.35	0/8058
All	All	0.20	0/23816	0.36	0/32254

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	5832	0	5762	36	0
1	B	5824	0	5756	32	0
1	C	5832	0	5762	45	0
1	D	5824	0	5756	44	0
2	A	60	0	24	3	0
2	B	60	0	24	4	0
2	C	60	0	24	3	0
2	D	60	0	24	4	0
3	A	2	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	B	2	0	0	0	0
3	C	2	0	0	0	0
3	D	2	0	0	0	0
4	A	32	0	12	1	0
4	B	32	0	12	1	0
4	C	32	0	12	0	0
4	D	32	0	12	0	0
All	All	23688	0	23180	161	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 3.

All (161) 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:C:139:ARG:NH1	1:C:201:SER:OG	2.15	0.79
1:A:584:LYS:NZ	1:A:586:ASP:OD1	2.19	0.75
1:B:584:LYS:NZ	1:B:586:ASP:OD1	2.21	0.73
1:C:208:PRO:HD2	1:C:211:ILE:HD12	1.74	0.70
1:C:584:LYS:NZ	1:C:586:ASP:OD1	2.25	0.69
1:D:208:PRO:HD2	1:D:211:ILE:HD12	1.77	0.67
1:C:227:LEU:HB2	1:C:460:ALA:HB3	1.76	0.66
1:B:208:PRO:HD2	1:B:211:ILE:HD12	1.79	0.63
1:A:55:THR:HG21	2:A:801:DTP:O1B	1.98	0.63
1:D:227:LEU:HB2	1:D:460:ALA:HB3	1.81	0.62
1:A:320:LYS:HE2	1:A:411:ARG:HB2	1.82	0.62
1:B:55:THR:HG21	2:B:801:DTP:O1B	1.99	0.62
1:C:320:LYS:HE2	1:C:411:ARG:HB2	1.81	0.62
1:A:576:GLY:HA3	1:A:607:LYS:HE3	1.82	0.61
1:A:139:ARG:NH1	1:A:201:SER:OG	2.34	0.61
1:D:320:LYS:HE2	1:D:411:ARG:HB2	1.82	0.60
1:D:584:LYS:NZ	1:D:586:ASP:OD1	2.34	0.60
1:D:139:ARG:NH1	1:D:201:SER:OG	2.34	0.60
1:D:338:GLN:NE2	1:D:434:ARG:O	2.33	0.60
1:D:276:THR:HG23	2:D:804:DTP:H2	1.84	0.59
1:A:208:PRO:HD2	1:A:211:ILE:HD12	1.85	0.58
1:A:227:LEU:HB2	1:A:460:ALA:HB3	1.86	0.58
1:B:320:LYS:HE2	1:B:411:ARG:HB2	1.86	0.57
1:D:532:SER:HA	1:D:677:GLY:HA3	1.87	0.56
1:C:307:PRO:HA	1:C:338:GLN:HB2	1.88	0.56
1:A:264:LEU:N	1:A:312:GLU:OE2	2.36	0.56

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:227:LEU:HB2	1:B:460:ALA:HB3	1.87	0.56
1:A:293:SER:O	1:A:295:GLY:N	2.38	0.55
1:D:152:GLU:O	1:D:158:GLN:NE2	2.37	0.55
1:D:260:ARG:NH1	1:D:448:PRO:HG3	2.20	0.55
1:D:576:GLY:HA3	1:D:607:LYS:HE2	1.89	0.55
2:B:801:DTP:H8	4:B:803:GTP:O1B	2.07	0.55
1:B:473:ASN:OD1	1:B:474:ASN:ND2	2.40	0.54
1:C:116:ASP:OD2	1:C:220:ARG:NH1	2.39	0.54
1:A:114:LYS:HE3	1:A:166:TYR:HE2	1.72	0.54
1:C:114:LYS:HE3	1:C:166:TYR:HE2	1.72	0.54
1:A:276:THR:HG23	2:A:804:DTP:H2	1.89	0.54
1:A:186:ARG:O	1:A:186:ARG:NH1	2.36	0.54
1:D:55:THR:HG21	2:D:801:DTP:O1B	2.07	0.54
1:D:532:SER:HB3	1:D:672:MET:HG2	1.90	0.54
1:C:264:LEU:N	1:C:312:GLU:OE2	2.40	0.53
1:A:532:SER:HA	1:A:677:GLY:HA3	1.90	0.53
1:B:276:THR:HG23	2:B:804:DTP:H2	1.90	0.53
1:B:692:SER:HG	1:B:728:THR:HG1	1.57	0.53
1:B:264:LEU:N	1:B:312:GLU:OE2	2.40	0.52
1:C:55:THR:HG21	2:C:801:DTP:O1B	2.09	0.51
1:C:276:THR:HG23	2:C:804:DTP:H2	1.92	0.51
1:A:636:GLU:OE1	1:A:678:TYR:OH	2.29	0.50
1:A:307:PRO:HA	1:A:338:GLN:HB2	1.94	0.50
1:C:385:ASP:O	1:C:390:LYS:NZ	2.33	0.50
1:D:115:TYR:OH	1:D:167:GLU:OE1	2.25	0.50
1:A:258:ALA:HB3	1:A:304:LEU:HD21	1.93	0.50
1:B:137:HIS:HA	1:B:170:GLN:HG3	1.94	0.49
1:D:122:ASP:O	1:D:189:ARG:NH1	2.45	0.49
1:D:552:LEU:HD23	1:D:616:LEU:HD12	1.95	0.49
1:D:530:ARG:HB3	1:D:667:GLU:OE2	2.12	0.49
1:C:214:GLY:O	1:C:216:ARG:N	2.46	0.49
1:C:137:HIS:HA	1:C:170:GLN:HG3	1.94	0.49
1:C:115:TYR:OH	1:C:167:GLU:OE1	2.28	0.48
1:D:642:VAL:HG22	1:D:655:VAL:HG22	1.95	0.48
1:B:139:ARG:NH1	1:B:201:SER:OG	2.46	0.48
2:B:804:DTP:H8	2:B:804:DTP:H5'1	1.95	0.48
2:A:801:DTP:H8	4:A:803:GTP:O1B	2.13	0.48
1:C:30:ALA:HA	1:C:33:LEU:HD12	1.94	0.48
1:B:258:ALA:HB3	1:B:304:LEU:HD21	1.96	0.48
1:C:642:VAL:HG22	1:C:655:VAL:HG22	1.96	0.48
1:A:338:GLN:NE2	1:A:434:ARG:O	2.45	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:137:HIS:HA	1:A:170:GLN:HG3	1.96	0.47
1:B:338:GLN:NE2	1:B:434:ARG:O	2.45	0.47
2:D:804:DTP:H8	2:D:804:DTP:H5'1	1.96	0.47
1:C:532:SER:HA	1:C:677:GLY:HA3	1.94	0.47
1:D:307:PRO:HA	1:D:338:GLN:HB2	1.97	0.47
1:A:149:LYS:HD3	1:A:149:LYS:HA	1.74	0.46
1:D:517:VAL:HG22	1:D:619:LEU:HD22	1.97	0.46
1:D:30:ALA:HA	1:D:33:LEU:HD12	1.97	0.46
1:B:385:ASP:O	1:B:390:LYS:NZ	2.37	0.46
1:A:440:LEU:HD23	1:A:728:THR:HB	1.96	0.46
1:B:6:LEU:HD11	1:D:297:VAL:HB	1.97	0.46
1:D:214:GLY:O	1:D:216:ARG:N	2.48	0.46
1:D:636:GLU:OE1	1:D:678:TYR:OH	2.34	0.46
1:A:311:LEU:HA	1:A:355:LEU:HB3	1.98	0.46
1:C:668:LEU:HB2	1:C:671:GLU:HG3	1.97	0.46
1:D:137:HIS:HA	1:D:170:GLN:HG3	1.98	0.45
2:C:804:DTP:H8	2:C:804:DTP:H5'1	1.98	0.45
1:A:521:ALA:HB3	1:A:632:THR:HG21	1.97	0.45
1:A:572:THR:HB	1:A:577:ILE:HB	1.98	0.45
1:C:149:LYS:HD3	1:C:149:LYS:HA	1.75	0.45
1:C:258:ALA:HB3	1:C:304:LEU:HD21	1.98	0.45
1:D:710:PRO:HB2	1:D:712:GLN:HG3	1.99	0.45
1:B:529:LYS:HB3	1:B:536:ALA:HB2	1.99	0.45
1:A:520:PHE:HB3	1:A:635:ILE:HA	1.98	0.44
1:A:530:ARG:HB3	1:A:667:GLU:OE2	2.17	0.44
1:D:258:ALA:HB3	1:D:304:LEU:HD21	1.99	0.44
1:D:101:ALA:HB3	1:D:104:ASP:OD2	2.18	0.44
1:B:30:ALA:HA	1:B:33:LEU:HD12	1.99	0.44
1:C:257:ASN:HB2	1:C:435:GLN:HB3	1.99	0.44
1:A:672:MET:HA	1:A:673:PRO:HD3	1.89	0.44
1:C:227:LEU:HD11	1:C:437:ASN:HB3	2.00	0.44
1:C:295:GLY:C	1:C:297:VAL:H	2.20	0.44
1:C:560:LYS:HG2	1:C:609:HIS:CG	2.53	0.44
1:C:186:ARG:O	1:C:186:ARG:NH1	2.35	0.44
1:B:157:VAL:HG23	1:B:167:GLU:OE2	2.18	0.44
1:C:521:ALA:HB3	1:C:632:THR:HG21	2.00	0.44
1:B:517:VAL:HG22	1:B:619:LEU:HD22	2.00	0.44
1:B:354:THR:OG1	1:B:392:ARG:NH1	2.52	0.43
1:D:11:ASP:OD1	1:D:11:ASP:N	2.50	0.43
1:B:532:SER:HA	1:B:677:GLY:HA3	1.99	0.43
1:B:572:THR:HB	1:B:577:ILE:HB	1.99	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:642:VAL:HG22	1:B:655:VAL:HG22	2.01	0.43
1:A:517:VAL:HG22	1:A:619:LEU:HD22	2.00	0.43
1:D:264:LEU:N	1:D:312:GLU:OE2	2.51	0.43
1:D:130:GLN:O	1:D:133:THR:OG1	2.31	0.43
1:D:317:LEU:HD11	1:D:402:MET:HG3	2.00	0.43
1:D:672:MET:HA	1:D:673:PRO:HD3	1.89	0.43
1:B:440:LEU:HD23	1:B:728:THR:HB	1.99	0.43
1:A:30:ALA:HA	1:A:33:LEU:HD12	2.00	0.43
1:C:285:PHE:O	1:C:289:VAL:HG23	2.19	0.43
1:C:248:VAL:HG11	1:C:289:VAL:HA	2.01	0.42
1:B:11:ASP:N	1:B:11:ASP:OD1	2.50	0.42
1:C:672:MET:HA	1:C:673:PRO:HD3	1.90	0.42
1:D:433:VAL:HG11	1:D:443:ALA:HB1	2.01	0.42
1:B:521:ALA:HB3	1:B:632:THR:HG21	2.01	0.42
1:C:219:THR:O	1:C:220:ARG:NH2	2.48	0.42
1:B:433:VAL:HG11	1:B:443:ALA:HB1	2.02	0.42
1:D:19:LEU:HD22	1:D:46:HIS:CE1	2.55	0.42
1:B:710:PRO:HB2	1:B:712:GLN:HG3	2.02	0.42
1:D:311:LEU:HA	1:D:355:LEU:HB3	2.00	0.42
1:C:627:GLN:OE1	1:C:645:LYS:NZ	2.49	0.42
1:B:98:GLU:HA	1:B:99:PRO:HD3	1.89	0.42
1:C:517:VAL:HG22	1:C:619:LEU:HD22	2.02	0.41
1:A:225:CYS:SG	1:A:442:ILE:HG13	2.60	0.41
1:B:227:LEU:HD11	1:B:437:ASN:HB3	2.02	0.41
1:A:285:PHE:O	1:A:289:VAL:HG23	2.20	0.41
1:D:234:LEU:HG	2:D:804:DTP:H2'2	2.03	0.41
1:D:419:HIS:CD2	1:D:725:GLY:HA2	2.55	0.41
1:C:6:LEU:HD11	1:C:16:ARG:NH1	2.35	0.41
1:A:418:ASP:OD1	1:A:418:ASP:N	2.53	0.41
1:D:227:LEU:HD11	1:D:437:ASN:HB3	2.02	0.41
1:D:520:PHE:HB3	1:D:635:ILE:HA	2.02	0.41
1:A:157:VAL:HG23	1:A:216:ARG:HH21	1.86	0.41
1:C:225:CYS:SG	1:C:442:ILE:HG13	2.61	0.41
1:C:418:ASP:OD1	1:C:418:ASP:N	2.53	0.41
1:C:576:GLY:O	1:C:603:ARG:NH1	2.53	0.41
1:A:444:LEU:HA	1:A:445:PRO:HD3	1.96	0.41
1:B:214:GLY:O	1:B:216:ARG:N	2.50	0.41
1:B:418:ASP:OD1	1:B:418:ASP:N	2.52	0.41
1:C:656:VAL:HG23	1:C:659:TYR:HB2	2.02	0.41
1:A:207:LEU:HA	1:A:208:PRO:HD3	1.94	0.41
1:A:433:VAL:HG11	1:A:443:ALA:HB1	2.03	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:180:LEU:HD13	1:C:488:ALA:HB1	2.03	0.41
1:D:131:MET:HA	1:D:134:PHE:CD2	2.55	0.41
1:D:418:ASP:OD1	1:D:418:ASP:N	2.54	0.41
1:A:619:LEU:HB2	1:A:693:ILE:HG23	2.04	0.40
1:C:101:ALA:HB3	1:C:104:ASP:OD2	2.22	0.40
1:C:207:LEU:HA	1:C:208:PRO:HD3	1.92	0.40
1:D:10:ARG:HH22	1:D:88:HIS:CE1	2.38	0.40
1:D:371:ASP:HB3	1:D:374:GLU:HB3	2.03	0.40
1:C:406:ARG:HE	1:C:732:GLN:HE21	1.69	0.40
1:C:433:VAL:HG11	1:C:443:ALA:HB1	2.02	0.40
1:C:440:LEU:HD23	1:C:728:THR:HB	2.02	0.40
1:C:681:LEU:O	1:C:685:MET:HG3	2.22	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	731/779 (94%)	710 (97%)	17 (2%)	4 (0%)	25	59
1	B	730/779 (94%)	711 (97%)	16 (2%)	3 (0%)	30	62
1	C	731/779 (94%)	710 (97%)	19 (3%)	2 (0%)	37	67
1	D	730/779 (94%)	708 (97%)	19 (3%)	3 (0%)	30	62
All	All	2922/3116 (94%)	2839 (97%)	71 (2%)	12 (0%)	30	62

All (12) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	216	ARG
1	A	294	GLN
1	A	299	GLY

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Mol	Chain	Res	Type
1	B	216	ARG
1	C	216	ARG
1	D	216	ARG
1	C	215	VAL
1	D	296	GLY
1	B	294	GLN
1	B	215	VAL
1	D	215	VAL
1	A	215	VAL

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	628/665 (94%)	626 (100%)	2 (0%)	91	96
1	B	627/665 (94%)	624 (100%)	3 (0%)	86	93
1	C	628/665 (94%)	626 (100%)	2 (0%)	91	96
1	D	627/665 (94%)	626 (100%)	1 (0%)	92	97
All	All	2510/2660 (94%)	2502 (100%)	8 (0%)	91	96

All (8) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	298	ARG
1	A	730	TYR
1	B	59	HIS
1	B	298	ARG
1	B	730	TYR
1	C	297	VAL
1	C	730	TYR
1	D	730	TYR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	105	HIS
1	C	732	GLN

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 20 ligands modelled in this entry, 8 are monoatomic - leaving 12 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	GTP	C	803	3	29,34,34	0.74	0	35,54,54	0.51	0
4	GTP	B	803	3	29,34,34	0.73	0	35,54,54	0.51	0
2	DTP	A	804	3	28,32,32	0.58	0	35,50,50	0.61	1 (2%)
2	DTP	D	804	3	28,32,32	0.57	0	35,50,50	0.63	1 (2%)
2	DTP	C	801	3	28,32,32	0.59	0	35,50,50	0.61	1 (2%)
2	DTP	D	801	3	28,32,32	0.58	0	35,50,50	0.61	1 (2%)
2	DTP	B	804	3	28,32,32	0.58	0	35,50,50	0.63	1 (2%)
2	DTP	B	801	3	28,32,32	0.59	0	35,50,50	0.61	1 (2%)
4	GTP	D	803	3	29,34,34	0.72	0	35,54,54	0.51	0
2	DTP	C	804	3	28,32,32	0.58	0	35,50,50	0.62	1 (2%)
2	DTP	A	801	3	28,32,32	0.57	0	35,50,50	0.62	1 (2%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
4	GTP	A	803	3	29,34,34	0.72	0	35,54,54	0.50	0

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
4	GTP	C	803	3	-	6/18/38/38	0/3/3/3
4	GTP	B	803	3	-	4/18/38/38	0/3/3/3
2	DTP	A	804	3	-	6/18/34/34	0/3/3/3
2	DTP	D	804	3	-	1/18/34/34	0/3/3/3
2	DTP	C	801	3	-	7/18/34/34	0/3/3/3
2	DTP	D	801	3	-	10/18/34/34	0/3/3/3
2	DTP	B	804	3	-	4/18/34/34	0/3/3/3
2	DTP	B	801	3	-	6/18/34/34	0/3/3/3
4	GTP	D	803	3	-	6/18/38/38	0/3/3/3
2	DTP	C	804	3	-	5/18/34/34	0/3/3/3
2	DTP	A	801	3	-	6/18/34/34	0/3/3/3
4	GTP	A	803	3	-	6/18/38/38	0/3/3/3

There are no bond length outliers.

All (8) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	801	DTP	C5-C6-N6	2.36	123.90	120.31
2	C	801	DTP	C5-C6-N6	2.35	123.89	120.31
2	A	804	DTP	C5-C6-N6	2.35	123.89	120.31
2	B	804	DTP	C5-C6-N6	2.35	123.89	120.31
2	C	804	DTP	C5-C6-N6	2.35	123.89	120.31
2	B	801	DTP	C5-C6-N6	2.34	123.88	120.31
2	D	801	DTP	C5-C6-N6	2.30	123.82	120.31
2	D	804	DTP	C5-C6-N6	2.30	123.82	120.31

There are no chirality outliers.

All (67) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	B	801	DTP	PB-O3B-PG-O3G

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Mol	Chain	Res	Type	Atoms
2	B	804	DTP	PB-O3B-PG-O2G
2	C	801	DTP	PB-O3B-PG-O3G
2	C	801	DTP	C5'-O5'-PA-O1A
2	C	801	DTP	C5'-O5'-PA-O3A
2	C	804	DTP	PB-O3B-PG-O2G
2	D	801	DTP	C5'-O5'-PA-O1A
2	D	801	DTP	C5'-O5'-PA-O3A
2	D	804	DTP	PB-O3B-PG-O2G
4	A	803	GTP	PB-O3B-PG-O2G
4	A	803	GTP	PB-O3B-PG-O3G
4	A	803	GTP	C5'-O5'-PA-O1A
4	B	803	GTP	PB-O3B-PG-O2G
4	B	803	GTP	C5'-O5'-PA-O1A
4	C	803	GTP	PB-O3B-PG-O2G
4	D	803	GTP	PB-O3B-PG-O2G
4	D	803	GTP	C5'-O5'-PA-O3A
4	D	803	GTP	C5'-O5'-PA-O1A
2	A	801	DTP	PB-O3A-PA-O1A
2	B	801	DTP	PG-O3B-PB-O1B
2	C	801	DTP	PG-O3B-PB-O1B
2	D	801	DTP	PB-O3B-PG-O1G
2	A	801	DTP	PB-O3B-PG-O3G
4	D	803	GTP	PB-O3B-PG-O3G
2	A	801	DTP	PA-O3A-PB-O1B
2	C	801	DTP	PB-O3A-PA-O2A
2	A	801	DTP	C5'-O5'-PA-O2A
2	A	801	DTP	C5'-O5'-PA-O3A
2	B	801	DTP	C5'-O5'-PA-O2A
2	C	801	DTP	C5'-O5'-PA-O2A
2	D	801	DTP	C5'-O5'-PA-O2A
4	C	803	GTP	C5'-O5'-PA-O1A
2	B	801	DTP	PB-O3A-PA-O2A
2	A	804	DTP	PB-O3B-PG-O1G
2	D	801	DTP	PG-O3B-PB-O1B
2	D	801	DTP	PA-O3A-PB-O1B
2	D	801	DTP	PB-O3A-PA-O1A
2	A	804	DTP	PB-O3B-PG-O2G
2	A	804	DTP	PB-O3B-PG-O3G
2	D	801	DTP	PB-O3B-PG-O2G
2	D	801	DTP	PB-O3B-PG-O3G
4	B	803	GTP	PB-O3B-PG-O3G
4	C	803	GTP	PB-O3B-PG-O3G

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Mol	Chain	Res	Type	Atoms
2	A	801	DTP	PB-O3A-PA-O2A
2	B	801	DTP	PG-O3B-PB-O2B
2	B	801	DTP	PB-O3A-PA-O1A
2	B	804	DTP	PB-O3A-PA-O2A
2	C	801	DTP	PG-O3B-PB-O2B
2	D	801	DTP	PB-O3A-PA-O2A
4	C	803	GTP	PA-O3A-PB-O2B
4	C	803	GTP	PB-O3A-PA-O2A
2	B	804	DTP	O4'-C4'-C5'-O5'
2	C	804	DTP	O4'-C4'-C5'-O5'
4	C	803	GTP	PB-O3B-PG-O1G
4	D	803	GTP	PB-O3B-PG-O1G
2	A	804	DTP	O4'-C4'-C5'-O5'
2	A	804	DTP	PA-O3A-PB-O2B
2	A	804	DTP	PB-O3A-PA-O2A
2	B	804	DTP	PA-O3A-PB-O2B
2	C	804	DTP	PG-O3B-PB-O2B
2	C	804	DTP	PA-O3A-PB-O2B
2	C	804	DTP	PB-O3A-PA-O2A
4	A	803	GTP	PG-O3B-PB-O2B
4	A	803	GTP	PA-O3A-PB-O2B
4	A	803	GTP	PB-O3A-PA-O2A
4	B	803	GTP	PA-O3A-PB-O2B
4	D	803	GTP	PA-O3A-PB-O2B

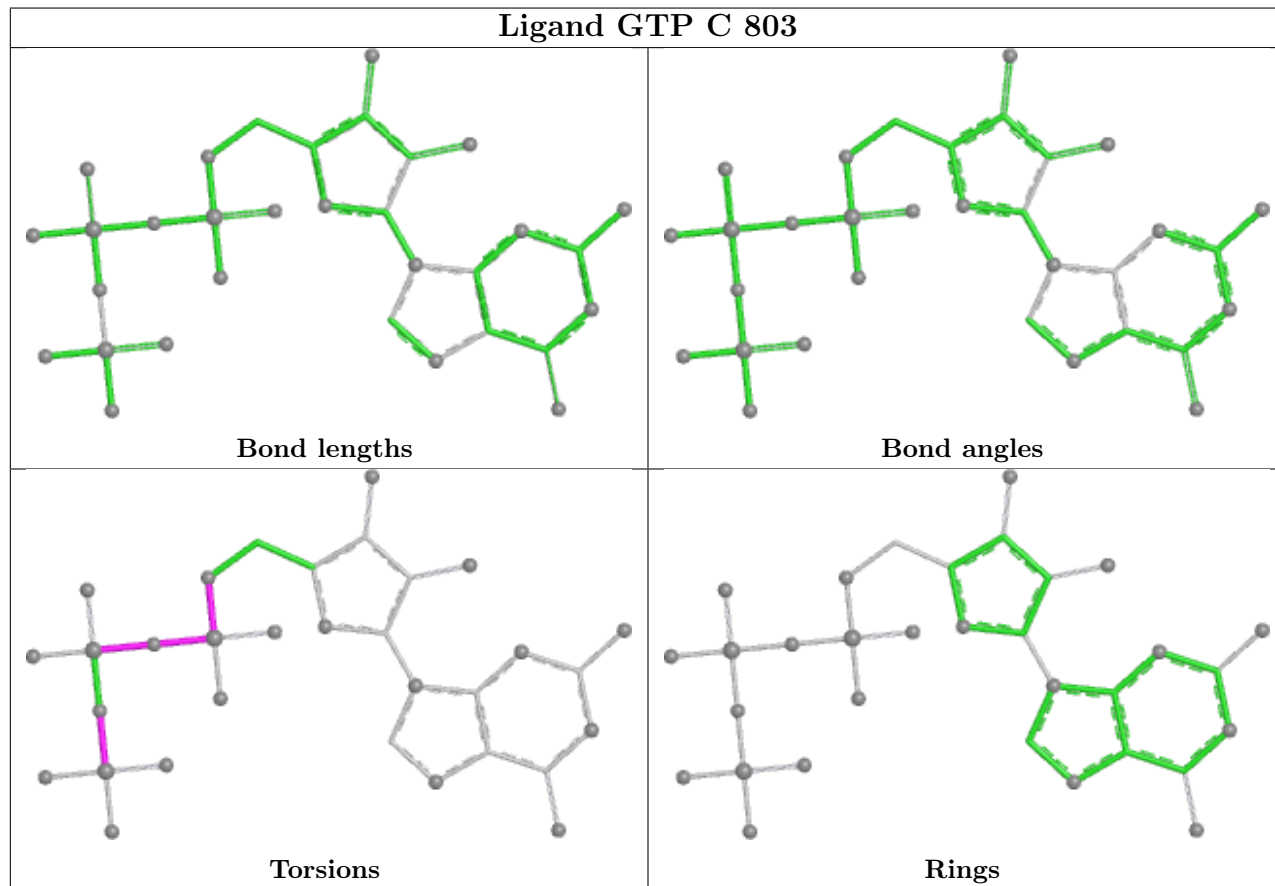
There are no ring outliers.

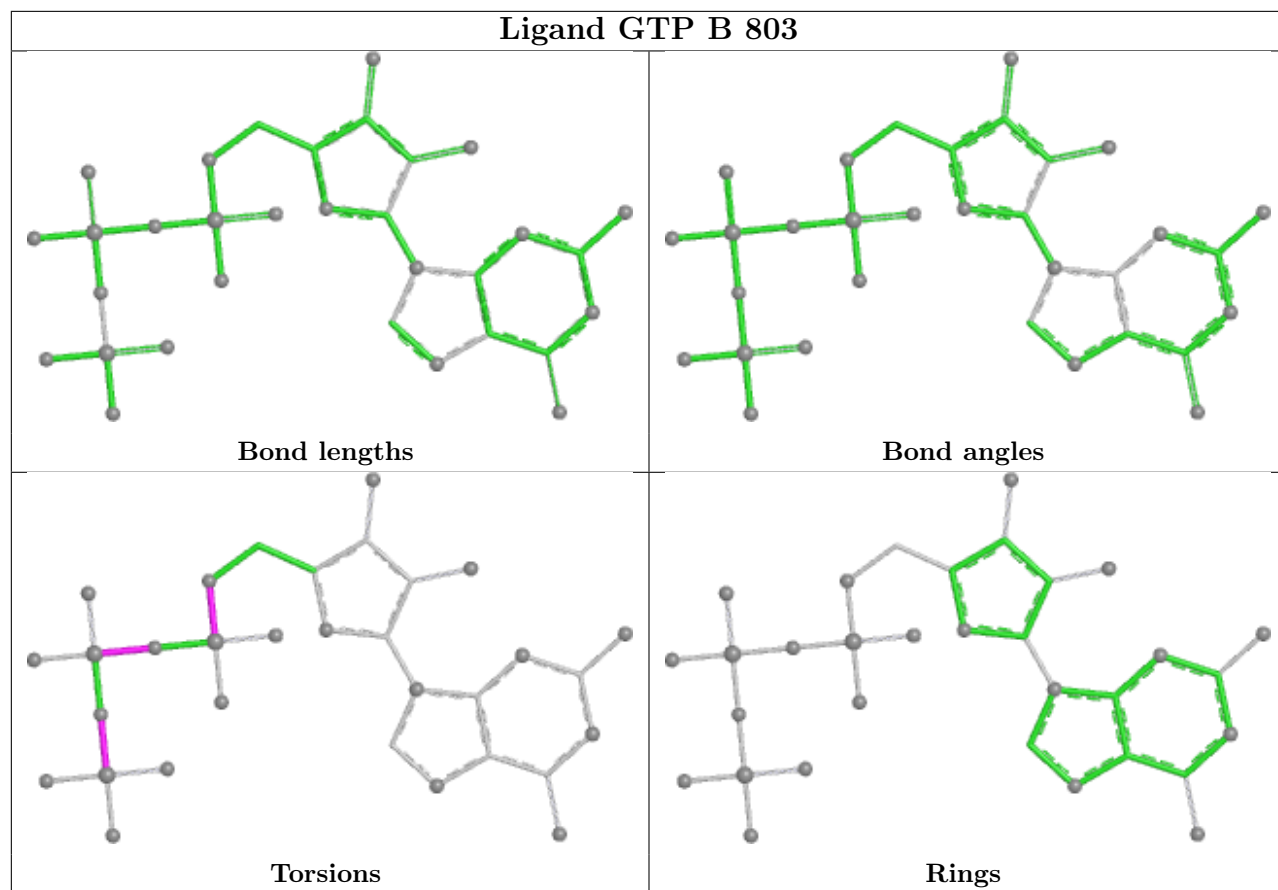
10 monomers are involved in 14 short contacts:

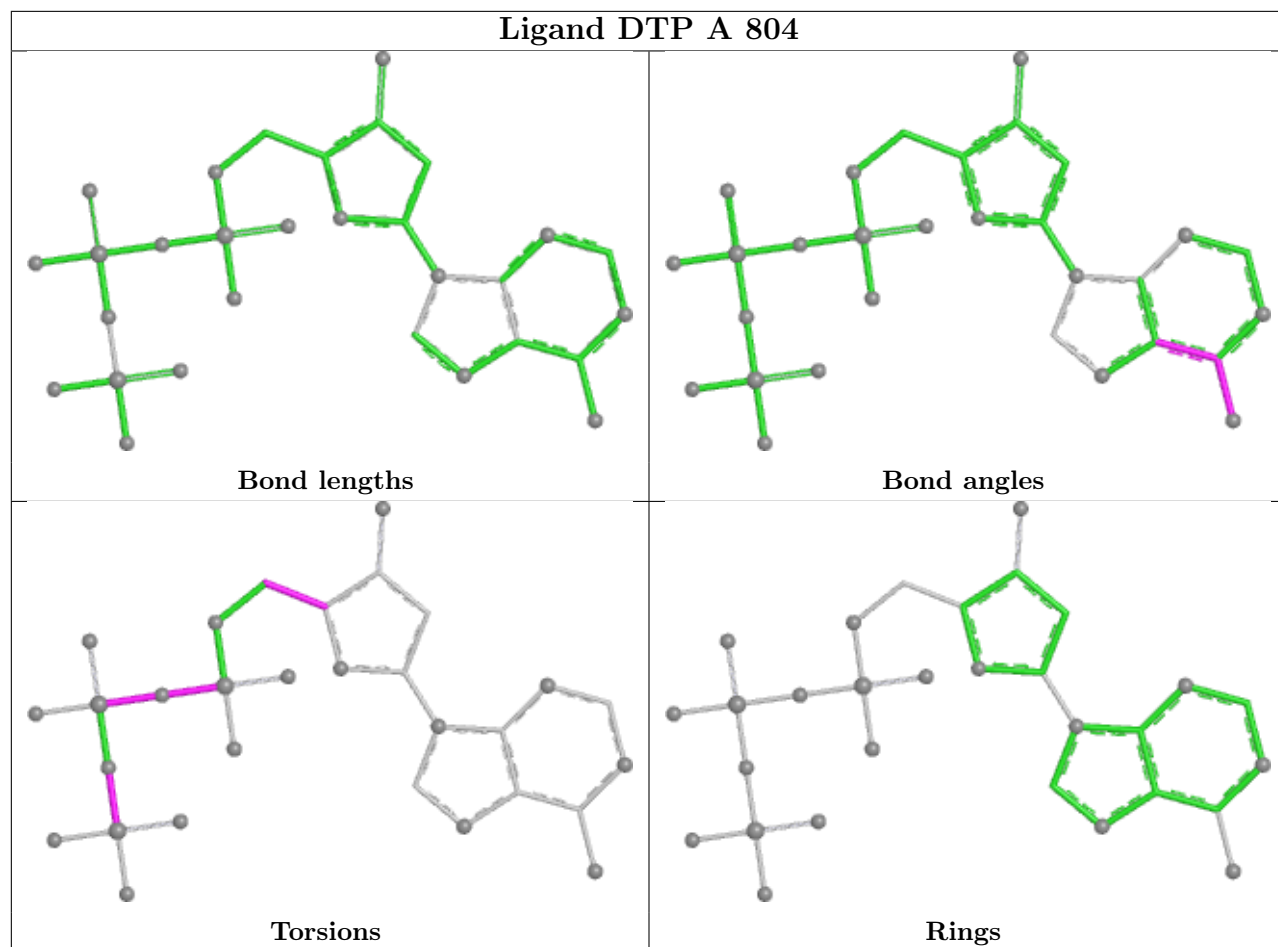
Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	B	803	GTP	1	0
2	A	804	DTP	1	0
2	D	804	DTP	3	0
2	C	801	DTP	1	0
2	D	801	DTP	1	0
2	B	804	DTP	2	0
2	B	801	DTP	2	0
2	C	804	DTP	2	0
2	A	801	DTP	2	0
4	A	803	GTP	1	0

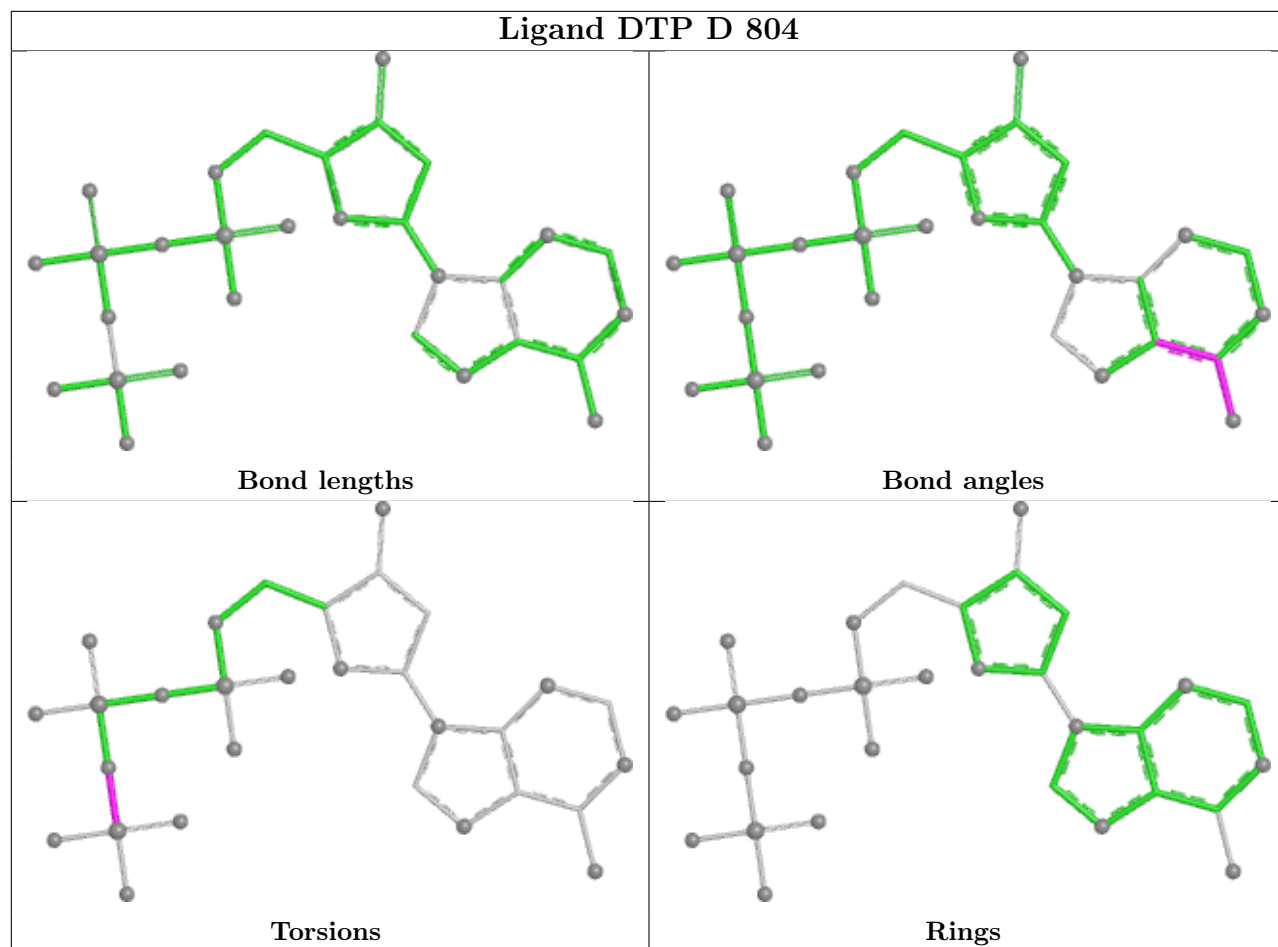
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In

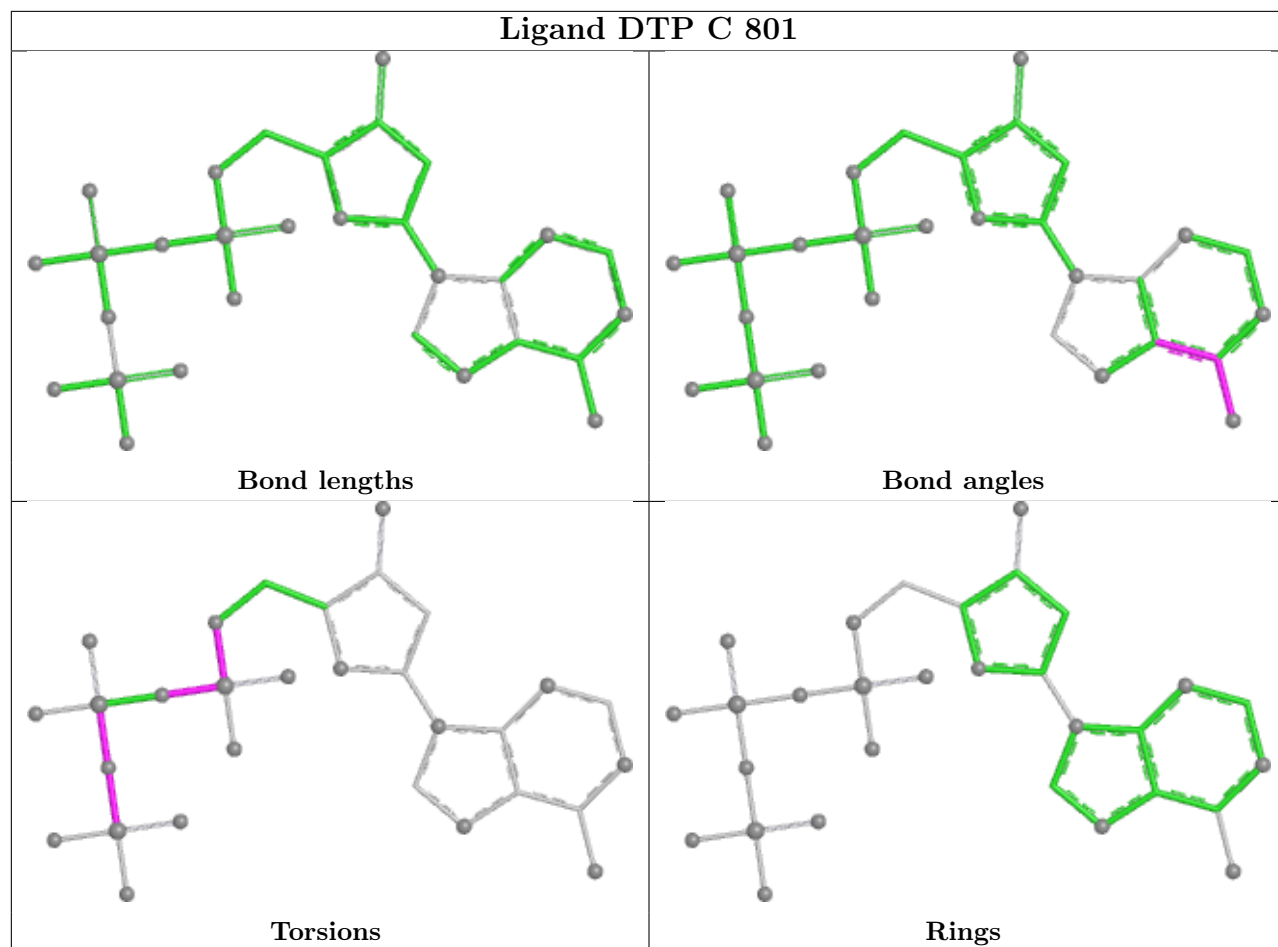
addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. 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.

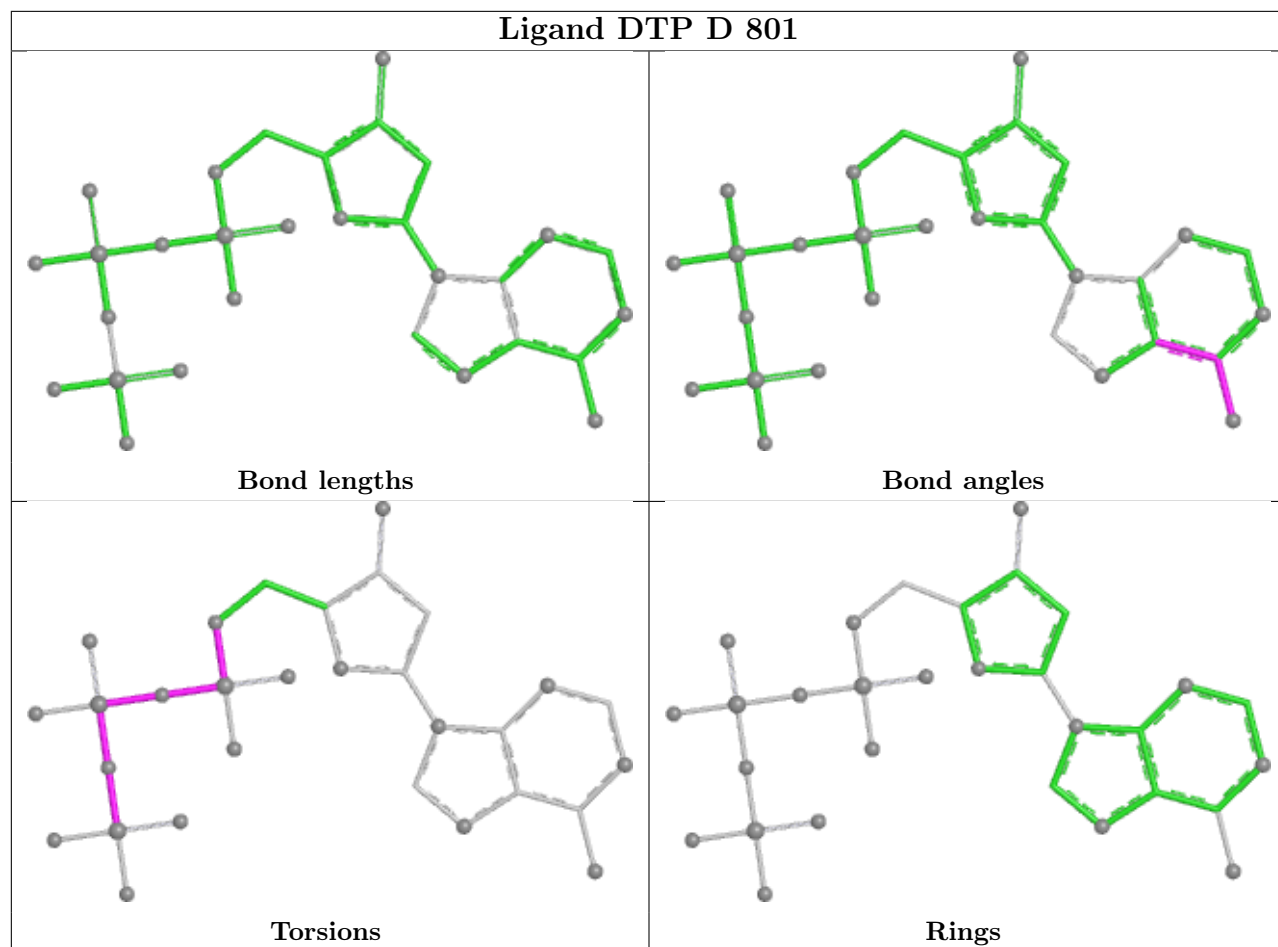


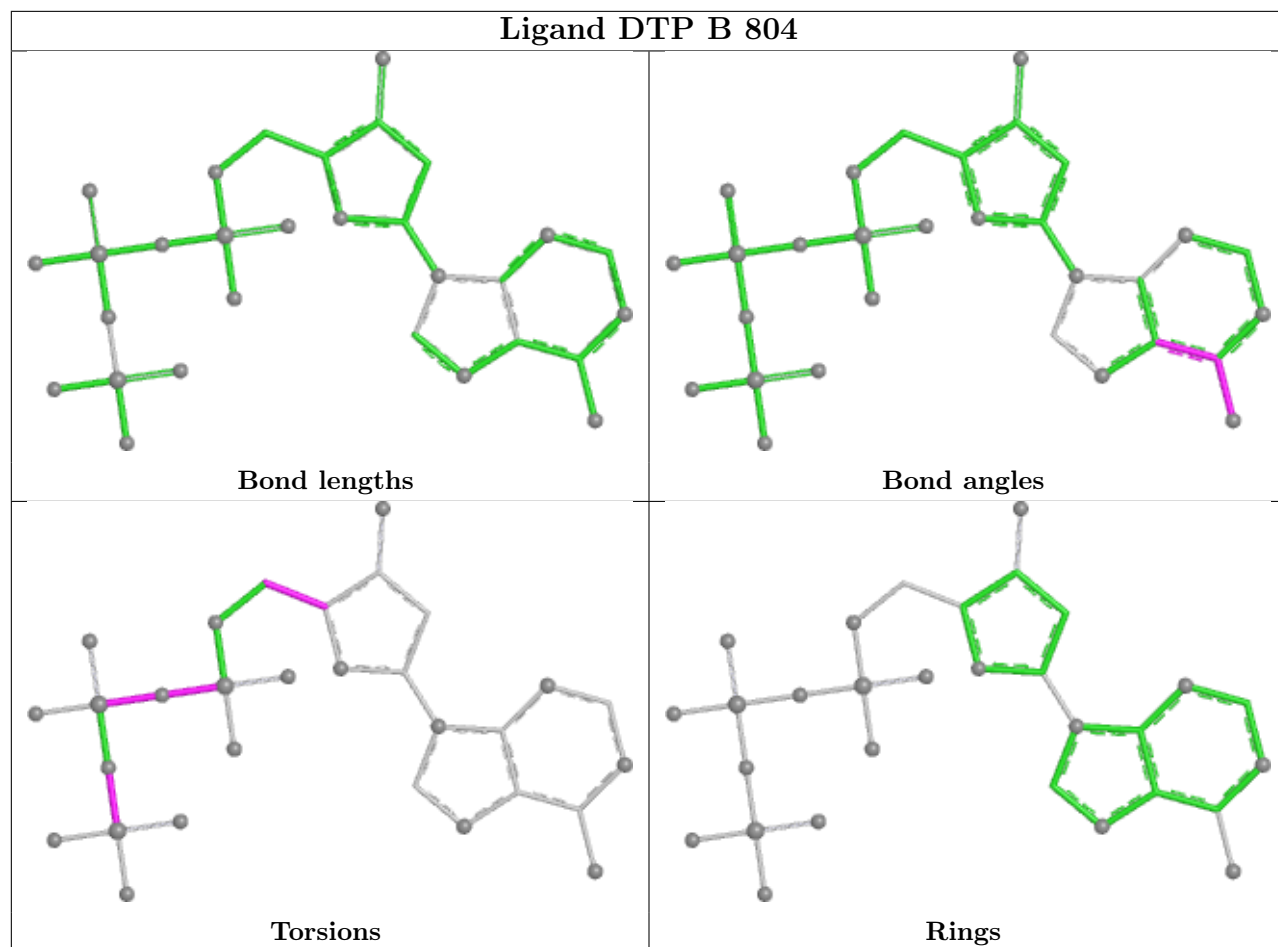


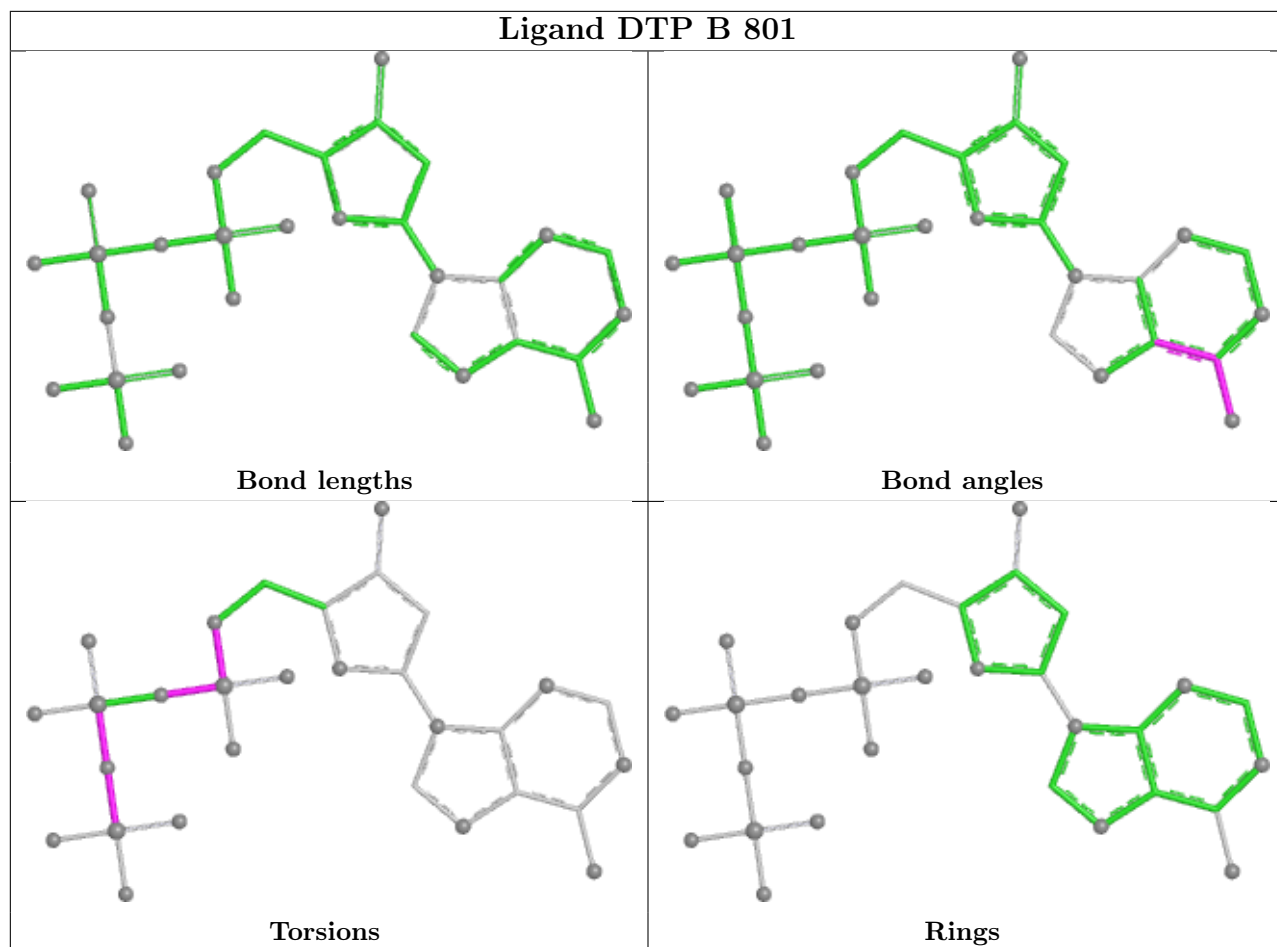


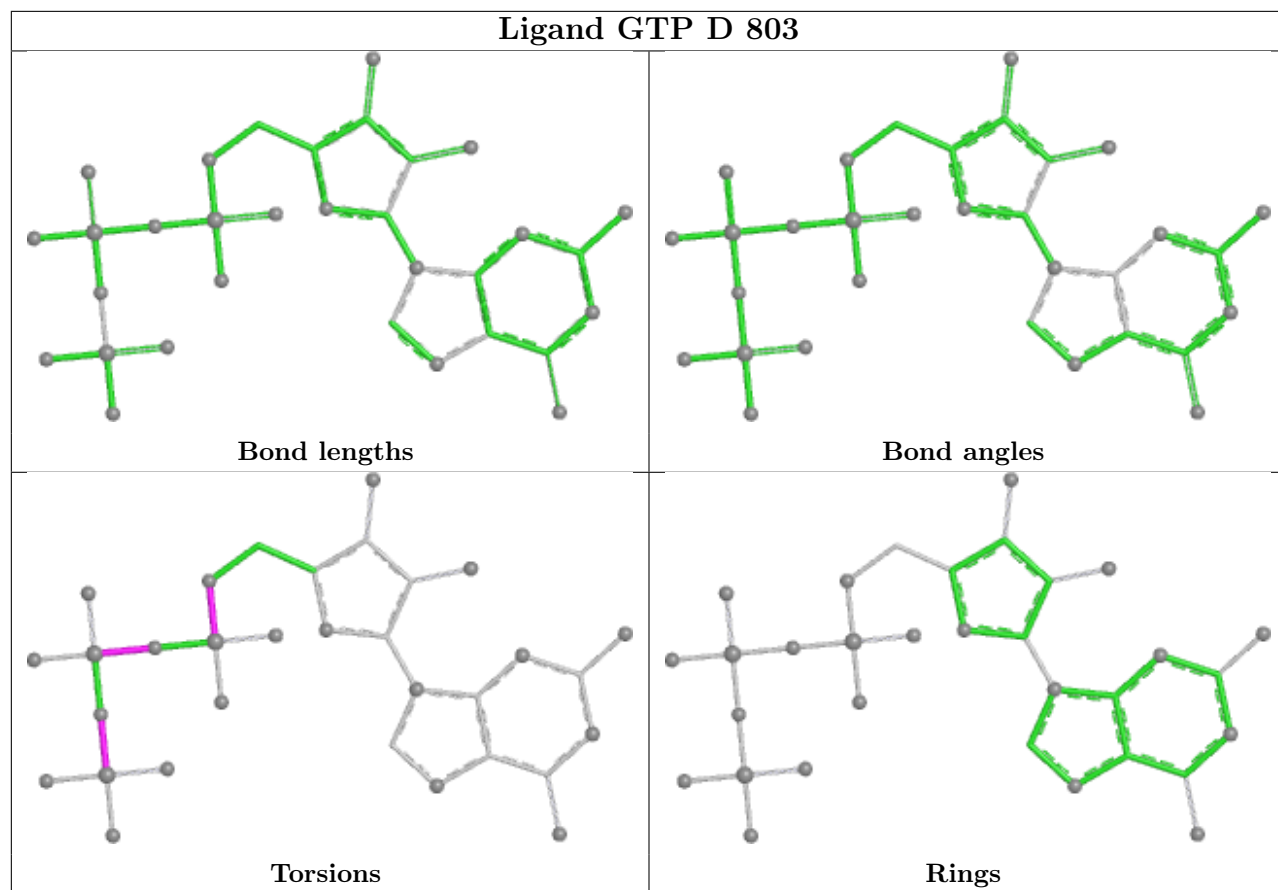


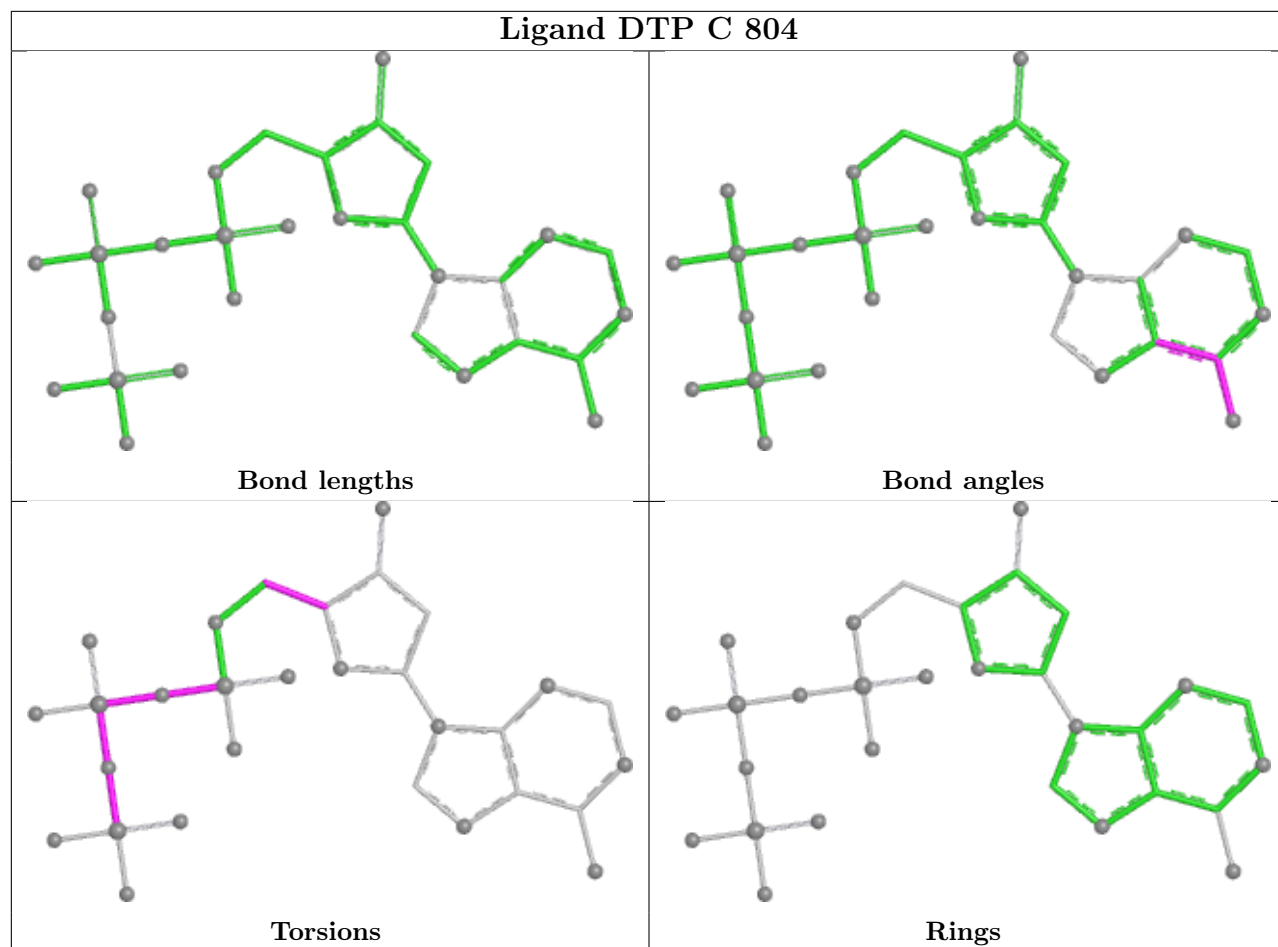


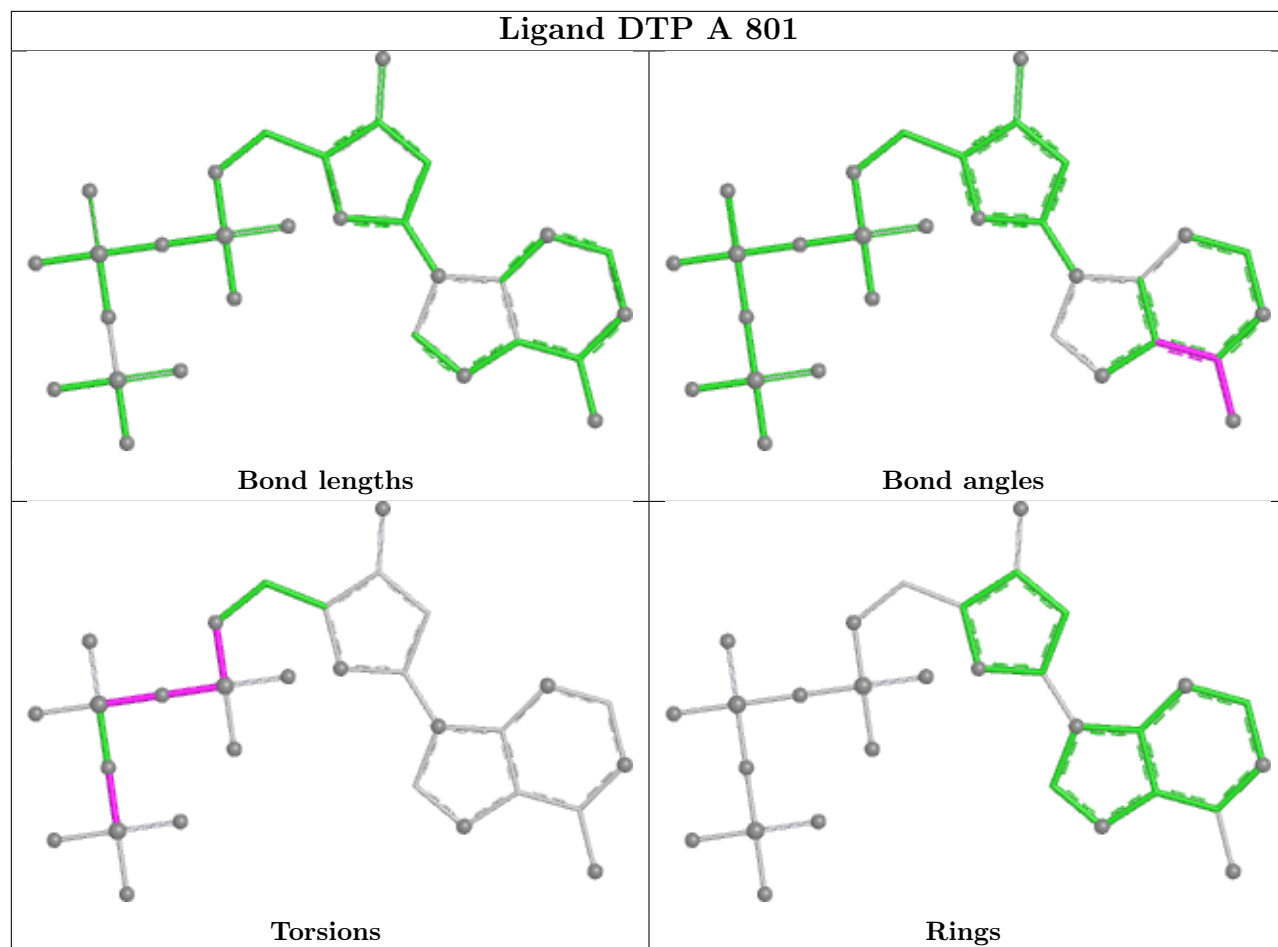


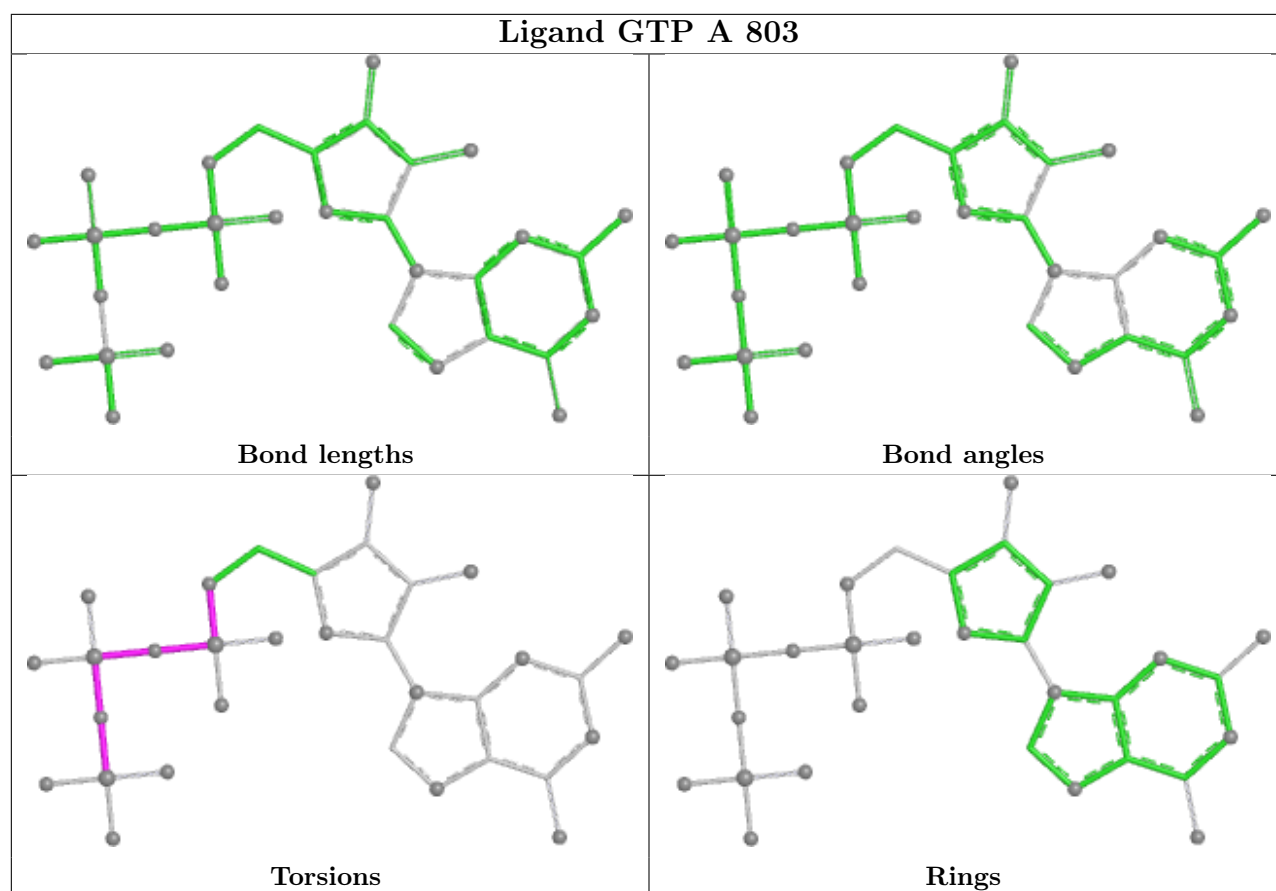












5.7 Other polymers [i](#)

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	733/779 (94%)	-0.69	0 100 100	81, 118, 170, 217	0
1	B	732/779 (93%)	-0.63	2 (0%) 90 79	90, 133, 177, 242	0
1	C	733/779 (94%)	-0.43	0 100 100	104, 175, 234, 255	0
1	D	732/779 (93%)	-0.37	6 (0%) 82 64	112, 181, 223, 286	0
All	All	2930/3116 (94%)	-0.53	8 (0%) 90 79	81, 151, 218, 286	0

All (8) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	5	LEU	3.9
1	D	621	PRO	3.4
1	D	443	ALA	2.6
1	D	488	ALA	2.4
1	B	5	LEU	2.4
1	D	215	VAL	2.3
1	B	296	GLY	2.1
1	D	297	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](#)

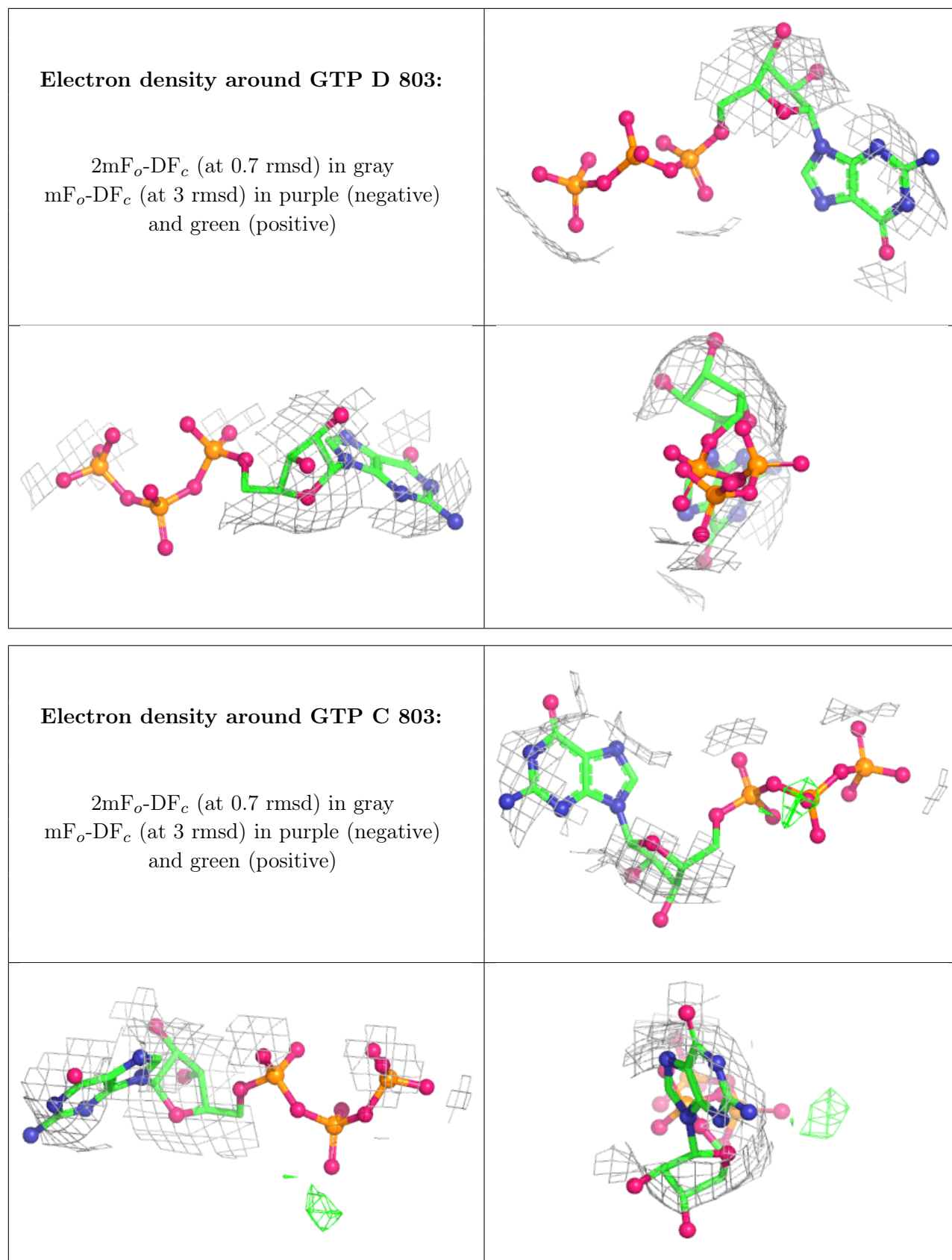
There are no monosaccharides in this entry.

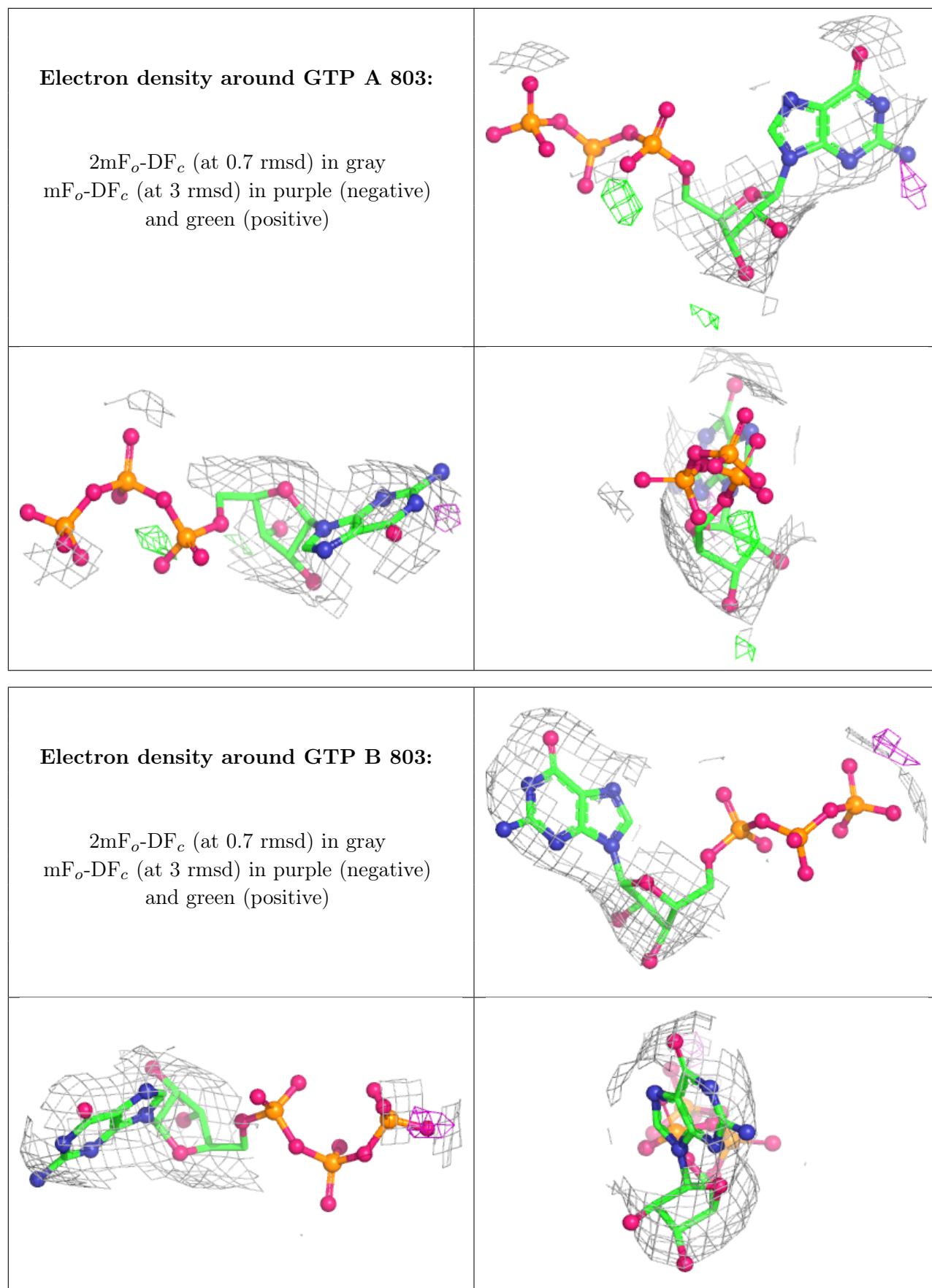
6.4 Ligands

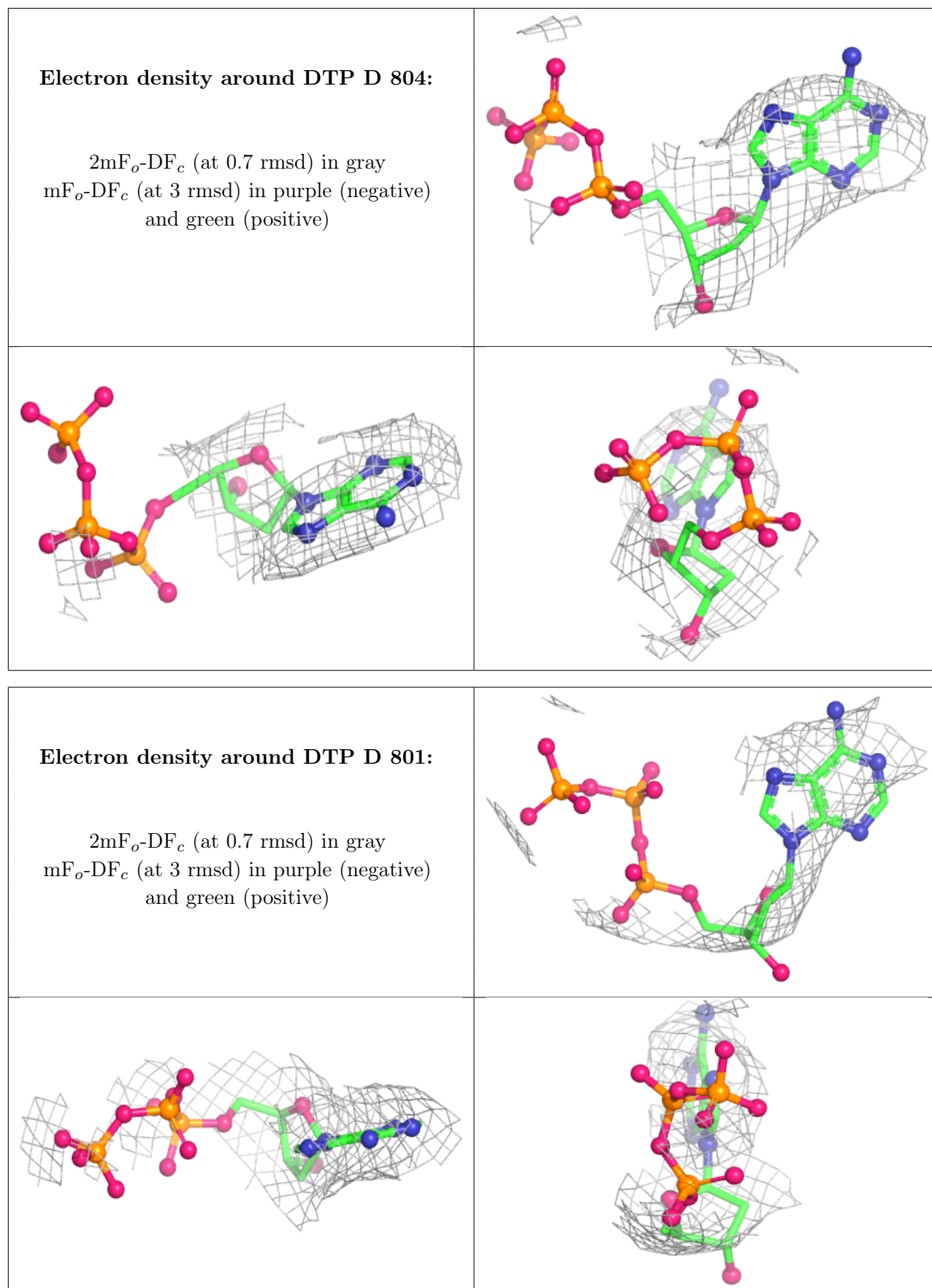
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
3	MG	D	805	1/1	0.81	0.09	116,116,116,116	0
4	GTP	D	803	32/32	0.91	0.05	179,187,211,275	0
4	GTP	C	803	32/32	0.93	0.06	158,220,231,234	0
3	MG	A	805	1/1	0.93	0.08	77,77,77,77	0
4	GTP	A	803	32/32	0.94	0.06	117,144,176,242	0
4	GTP	B	803	32/32	0.94	0.05	142,156,181,198	0
2	DTP	D	804	30/30	0.95	0.06	109,133,170,182	0
2	DTP	D	801	30/30	0.96	0.05	102,191,240,246	0
3	MG	B	805	1/1	0.96	0.05	53,53,53,53	0
3	MG	C	805	1/1	0.96	0.04	82,82,82,82	0
2	DTP	C	804	30/30	0.96	0.06	96,138,169,177	0
2	DTP	C	801	30/30	0.97	0.05	111,153,219,225	0
2	DTP	A	804	30/30	0.97	0.05	76,110,120,128	0
2	DTP	A	801	30/30	0.98	0.05	80,168,195,201	0
2	DTP	B	801	30/30	0.98	0.05	127,149,159,165	0
2	DTP	B	804	30/30	0.98	0.04	61,100,112,121	0
3	MG	C	802	1/1	0.99	0.02	161,161,161,161	0
3	MG	B	802	1/1	0.99	0.02	149,149,149,149	0
3	MG	D	802	1/1	0.99	0.02	159,159,159,159	0
3	MG	A	802	1/1	0.99	0.05	104,104,104,104	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.

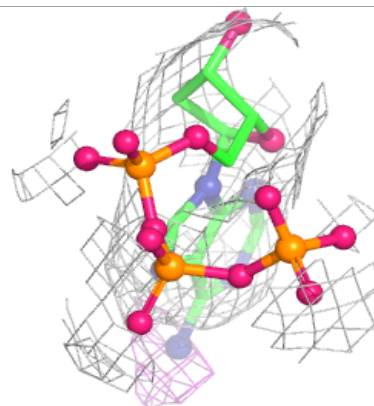
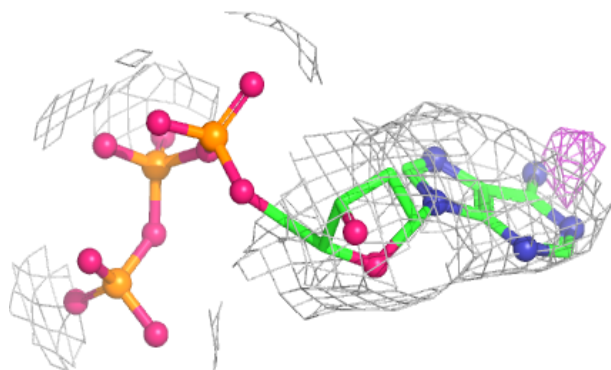
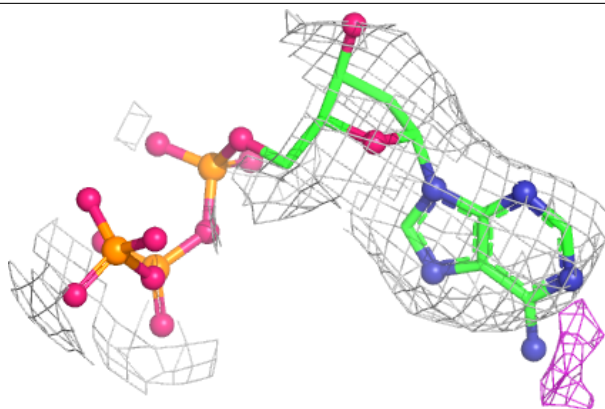




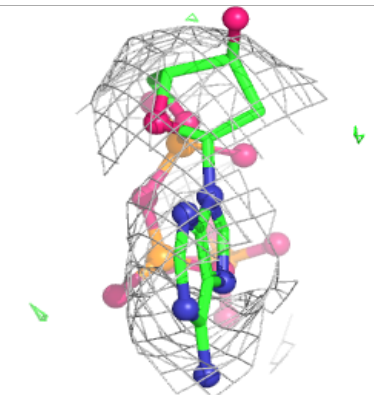
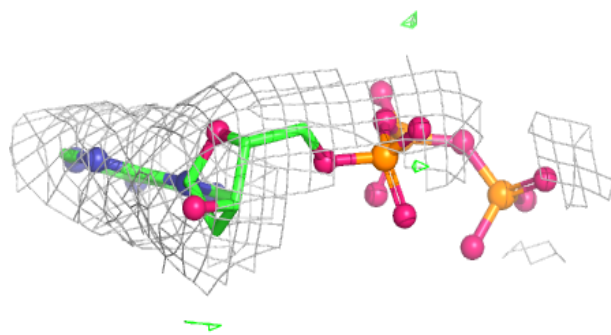
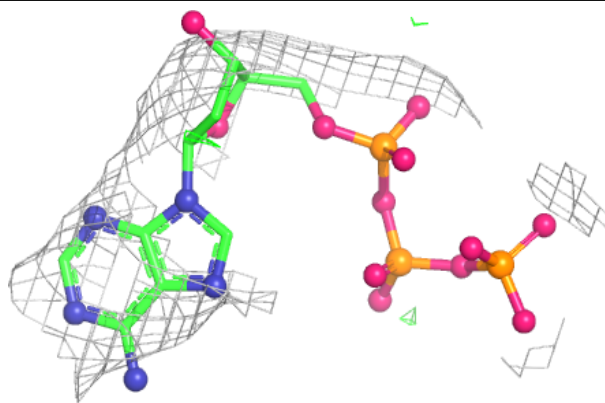


Electron density around DTP C 804:

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

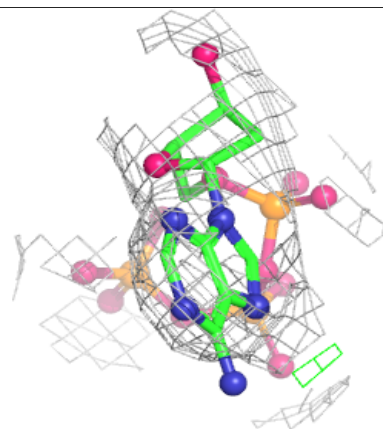
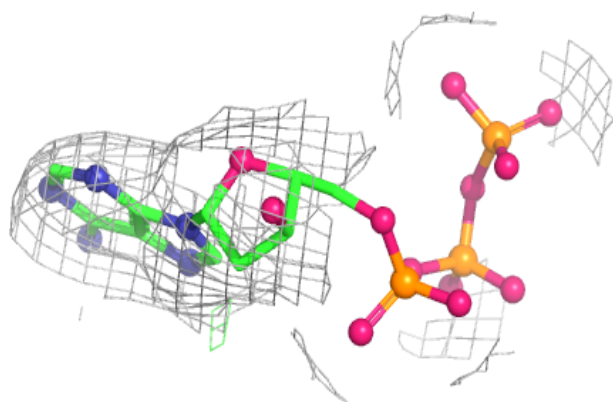
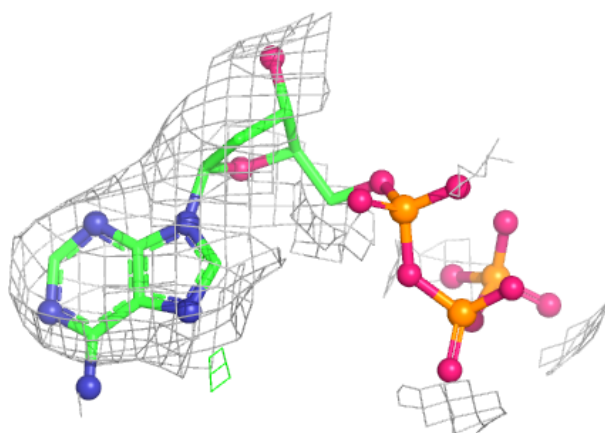
**Electron density around DTP C 801:**

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

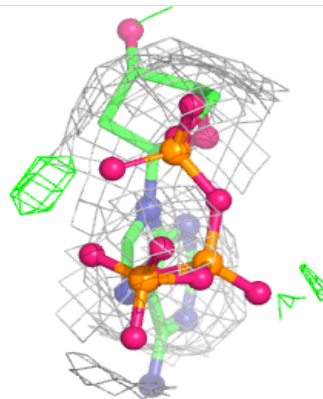
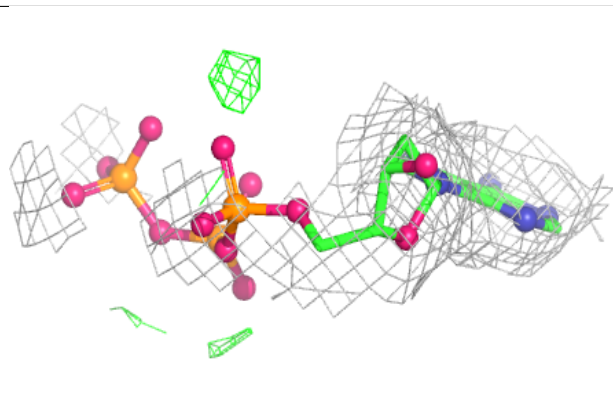
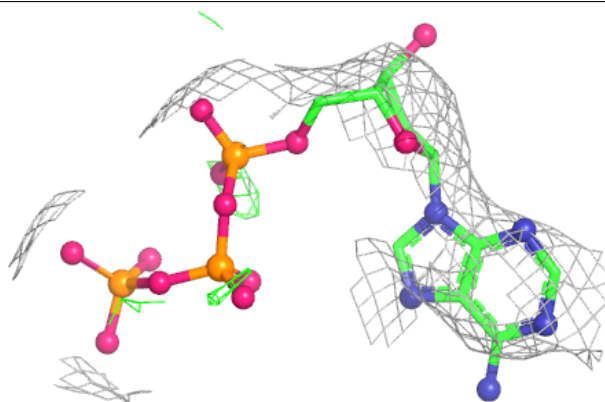


Electron density around DTP A 804:

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

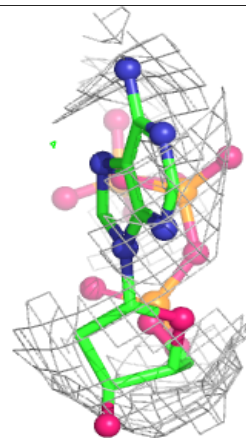
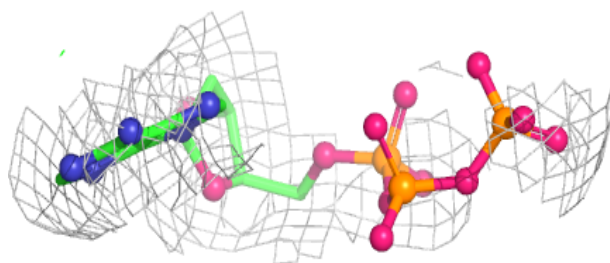
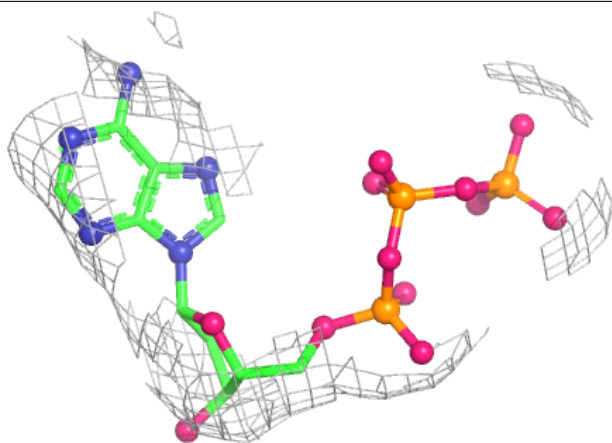
**Electron density around DTP A 801:**

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

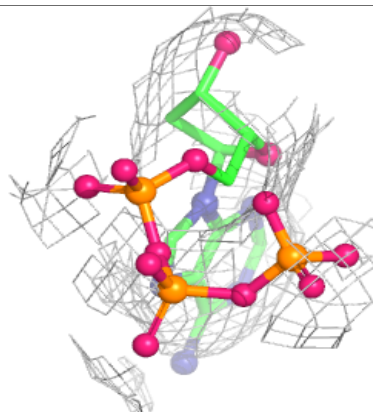
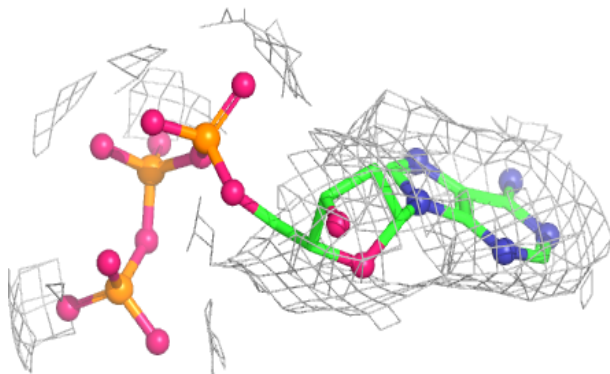
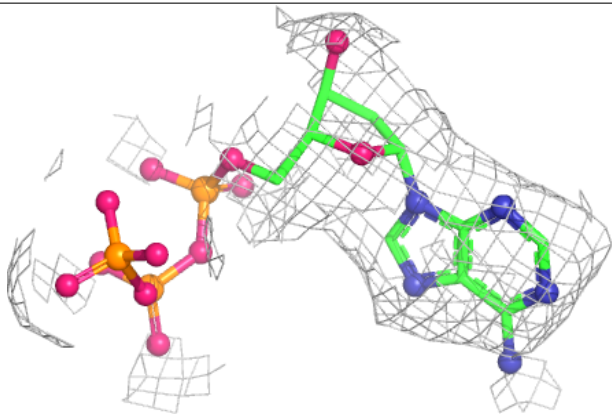


Electron density around DTP B 801:

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

**Electron density around DTP B 804:**

$2mF_o-DF_c$ (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.