wwPDB X-ray Structure Validation Summary Report (i)

Sep 12, 2023 – 07:09 AM EDT

PDB ID	:	4O2B
Title	:	Tubulin-Colchicine complex
Authors	:	Prota, A.E.; Franck, D.; Bachmann, F.; Bargsten, K.; Buey, R.M.; Pohlmann, J.; Reinelt, S.; Lane, H.; Steinmetz, M.O.
Deposited on	:	2013-12-17
Resolution	:	2.30 Å(reported)

This is a wwPDB X-ray Structure Validation Summary 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 (i) 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 (i)) were used in the production of this report:

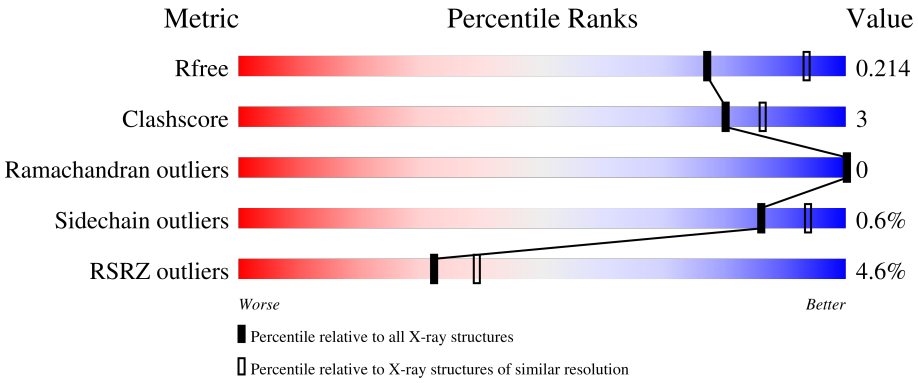
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.35.1
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.35.1

1 Overall quality at a glance (i)

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

The reported resolution of this entry is 2.30 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}	130704	5042 (2.30-2.30)
Clashscore	141614	5643 (2.30-2.30)
Ramachandran outliers	138981	5575 (2.30-2.30)
Sidechain outliers	138945	5575 (2.30-2.30)
RSRZ outliers	127900	4938 (2.30-2.30)

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

Mol	Chain	Length	Quality of chain
1	A	451	90% 7% ·
1	C	451	90% 8% ·
2	B	445	% 87% 7% 5%
2	D	445	3% 89% 5% 5%
3	E	143	4% 83% · 15%

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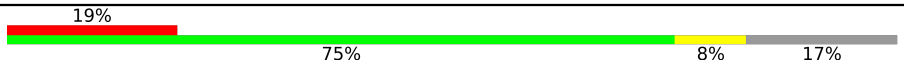
Mol	Chain	Length	Quality of chain
4	F	384	

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
7	GOL	B	507	-	-	-	X

2 Entry composition (i)

There are 15 unique types of molecules in this entry. The entry contains 18288 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 Tubulin alpha-1B chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	439	Total	C	N	O	S	0	13	0
			3488	2217	585	661	25			
1	C	440	Total	C	N	O	S	0	11	0
			3489	2209	588	668	24			

- Molecule 2 is a protein called Tubulin beta-2B chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	422	Total	C	N	O	S	0	11	0
			3374	2126	568	653	27			
2	D	421	Total	C	N	O	S	0	4	0
			3326	2094	562	642	28			

- Molecule 3 is a protein called Stathmin-4.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	E	121	Total	C	N	O	S	0	3	0
			1016	628	183	199	6			

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
E	3	MET	-	cloning artifact	UNP P63043
E	4	ALA	-	cloning artifact	UNP P63043

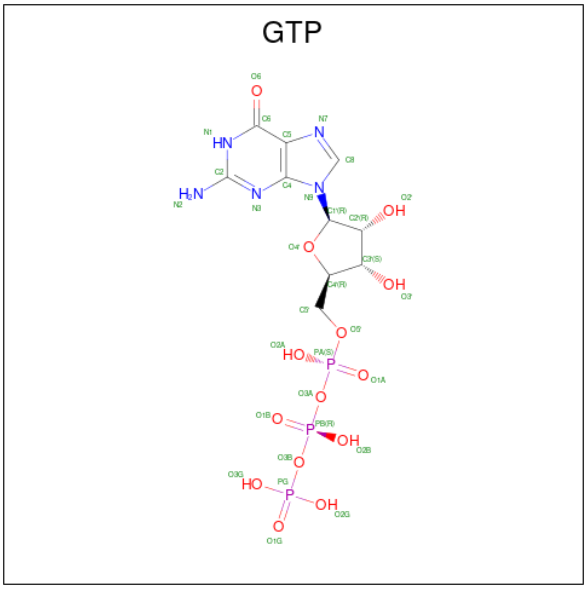
- Molecule 4 is a protein called Tubulin-tyrosine ligase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
4	F	319	Total	C	N	O	S	0	5	0
			2633	1706	436	477	14			

There are 6 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
F	379	HIS	-	expression tag	UNP E1BQ43
F	380	HIS	-	expression tag	UNP E1BQ43
F	381	HIS	-	expression tag	UNP E1BQ43
F	382	HIS	-	expression tag	UNP E1BQ43
F	383	HIS	-	expression tag	UNP E1BQ43
F	384	HIS	-	expression tag	UNP E1BQ43

- Molecule 5 is GUANOSINE-5'-TRIPHOSPHATE (three-letter code: GTP) (formula: $C_{10}H_{16}N_5O_{14}P_3$).



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

- 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		
6	C	1	Total	Mg	0	0
			1	1		
6	D	1	Total	Mg	0	0
			1	1		

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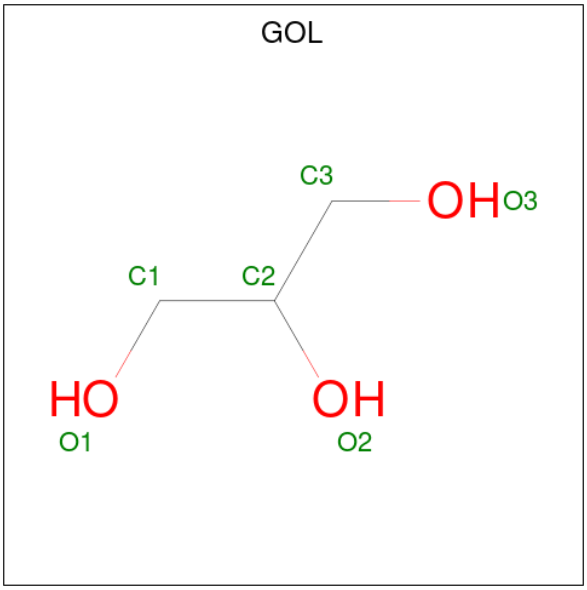
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	F	1	Total Mg 1 1	0	0

- Molecule 7 is GLYCEROL (three-letter code: GOL) (formula: $C_3H_8O_3$).



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

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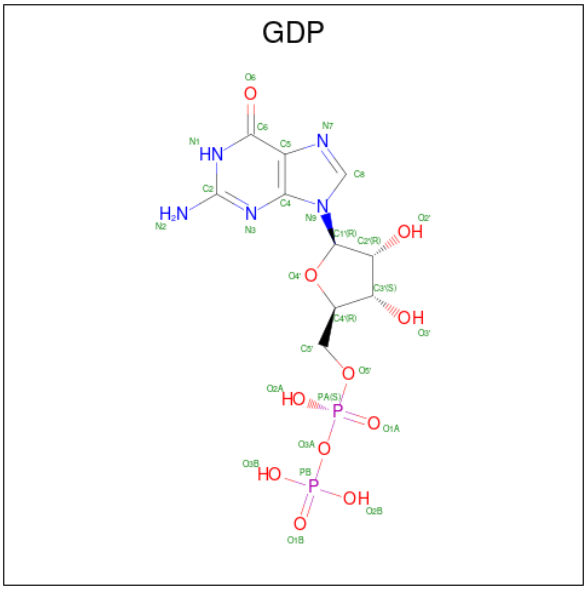
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
7	D	1	Total C O 6 3 3	0	0
7	D	1	Total C O 6 3 3	0	0
7	E	1	Total C O 6 3 3	0	0

- Molecule 8 is CALCIUM ION (three-letter code: CA) (formula: Ca).

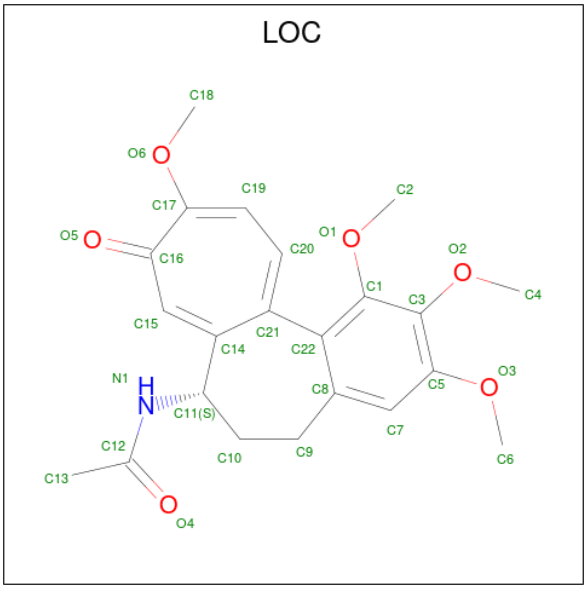
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
8	A	1	Total Ca 1 1	0	0
8	B	1	Total Ca 1 1	0	0
8	C	1	Total Ca 1 1	0	0

- Molecule 9 is GUANOSINE-5'-DIPHOSPHATE (three-letter code: GDP) (formula: $C_{10}H_{15}N_5O_{11}P_2$).



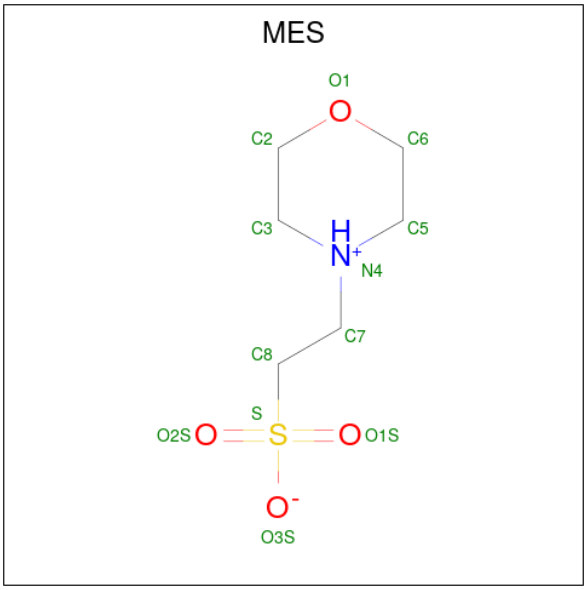
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
9	B	1	Total C N O P 28 10 5 11 2	0	0
9	D	1	Total C N O P 28 10 5 11 2	0	0

- Molecule 10 is N-[(7S)-1,2,3,10-tetramethoxy-9-oxo-6,7-dihydro-5H-benzo[d]heptalen-7-yl]et hanamide (three-letter code: LOC) (formula: $C_{22}H_{25}NO_6$).



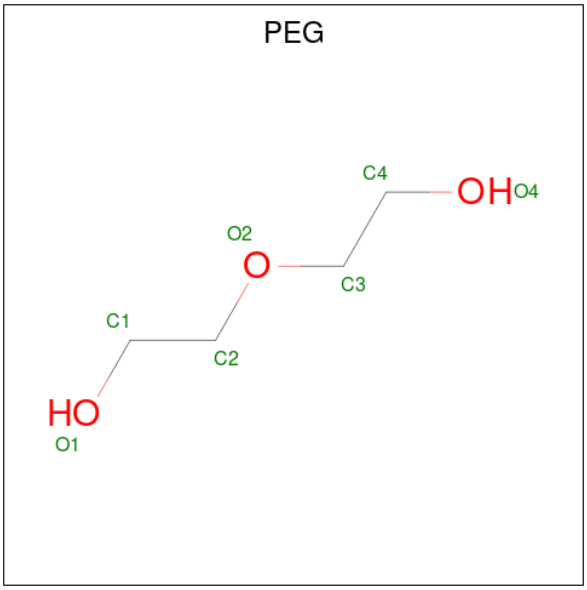
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
10	B	1	Total C N O 29 22 1 6	0	0
10	D	1	Total C N O 29 22 1 6	0	0

- Molecule 11 is 2-(N-MORPHOLINO)-ETHANESULFONIC ACID (three-letter code: MES) (formula: $C_6H_{13}NO_4S$).



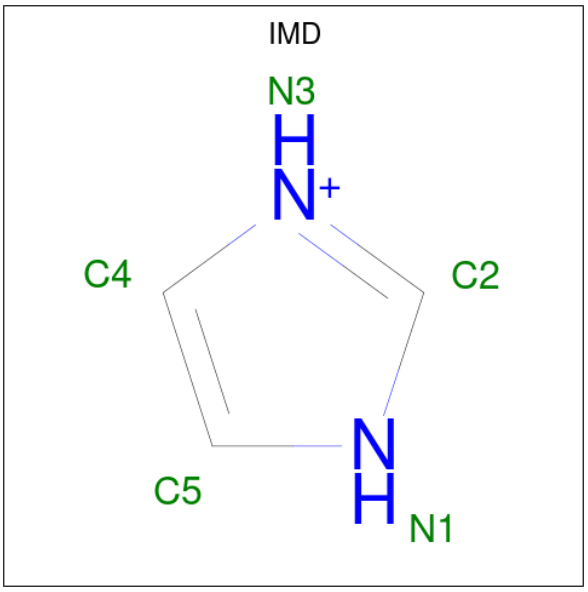
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
11	B	1	Total	C	N	O	S	0	0
			12	6	1	4	1		

- Molecule 12 is DI(HYDROXYETHYL)ETHER (three-letter code: PEG) (formula: $C_4H_{10}O_3$).



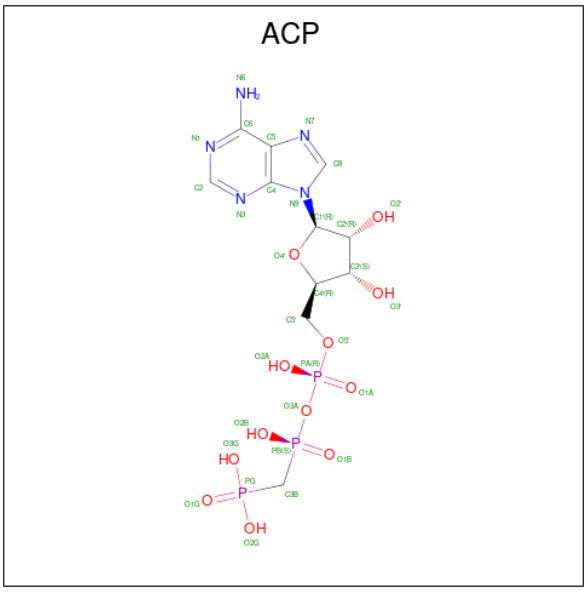
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
12	C	1	Total	C	O		0	0
			7	4	3			
12	C	1	Total	C	O		0	0
			7	4	3			

- Molecule 13 is IMIDAZOLE (three-letter code: IMD) (formula: $C_3H_5N_2$).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
13	C	1	Total C N 5 3 2	0	0
13	C	1	Total C N 5 3 2	0	0
13	C	1	Total C N 5 3 2	0	0

- Molecule 14 is PHOSPHOMETHYLPHOSPHONIC ACID ADENYLATE ESTER (three-letter code: ACP) (formula: $C_{11}H_{18}N_5O_{12}P_3$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
14	F	1	Total	C	N	O	P	0	0
			31	11	5	12	3		

- Molecule 15 is water.

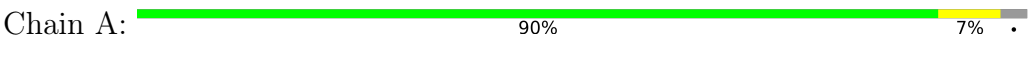
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
15	A	127	Total	O	0	0
			127	127		
15	B	132	Total	O	0	0
			132	132		
15	C	219	Total	O	0	0
			219	219		
15	D	84	Total	O	0	0
			84	84		
15	E	29	Total	O	0	0
			29	29		
15	F	35	Total	O	0	0
			35	35		

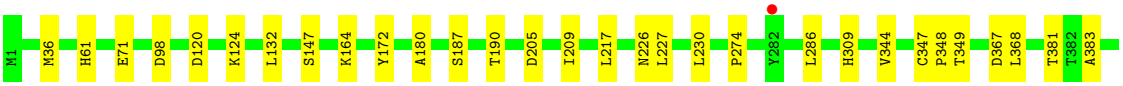
3 Residue-property plots (i)

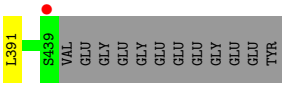
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density.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

Chain A:

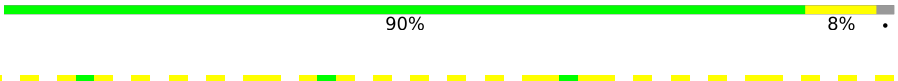


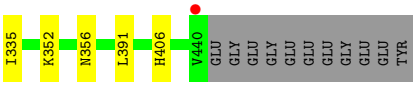




• Molecule 1: Tubulin alpha-1B chain

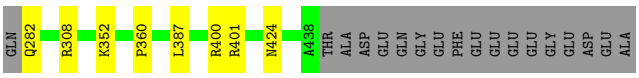
Chain C:





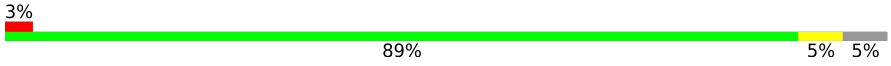
• Molecule 2: Tubulin beta-2B chain

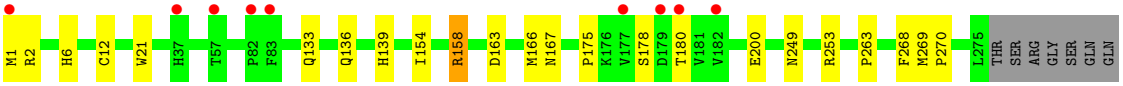
Chain B:

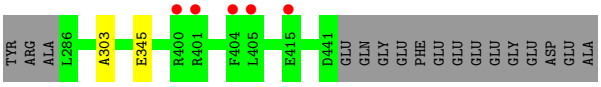


• Molecule 2: Tubulin beta-2B chain

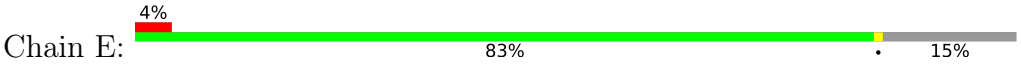
Chain D:

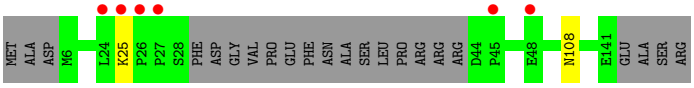




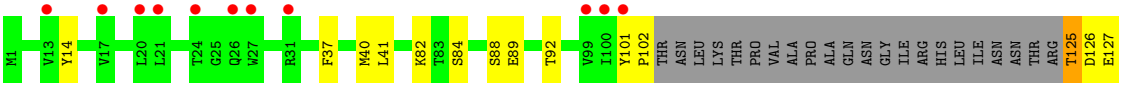


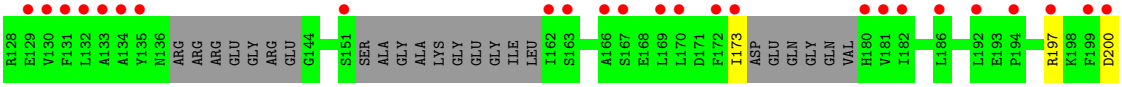
• Molecule 3: Stathmin-4

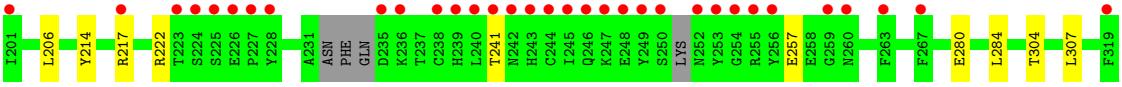


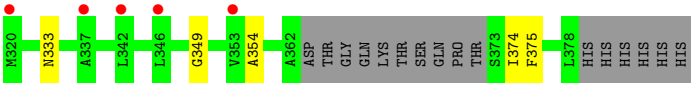


• Molecule 4: Tubulin-tyrosine ligase









4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α, β, γ	104.31Å 157.01Å 180.22Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	62.70 – 2.30 78.50 – 2.20	Depositor EDS
% Data completeness (in resolution range)	100.0 (62.70-2.30) 97.8 (78.50-2.20)	Depositor EDS
R_{merge}	0.12	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.51 (at 2.20Å)	Xtriage
Refinement program	PHENIX (phenix.refine: 1.8.2_1309)	Depositor
R, R_{free}	0.182 , 0.213 0.183 , 0.214	Depositor DCC
R_{free} test set	2000 reflections (1.36%)	wwPDB-VP
Wilson B-factor (Å^2)	41.5	Xtriage
Anisotropy	0.170	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.35 , 47.0	EDS
L-test for twinning[2]	$< \|L\| > = 0.49$, $< L^2 > = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.96	EDS
Total number of atoms	18288	wwPDB-VP
Average B, all atoms (Å^2)	54.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.41% of the height of the origin peak. No significant pseudotranslation is detected.*

[1] Intensities estimated from amplitudes.

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

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: MES, GOL, ACP, GTP, GDP, PEG, MG, LOC, IMD, CA

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	0.22	0/3605	0.39	0/4895
1	C	0.22	0/3597	0.40	0/4885
2	B	0.22	0/3478	0.38	0/4710
2	D	0.21	0/3411	0.37	0/4622
3	E	0.20	0/1033	0.31	0/1370
4	F	0.21	0/2704	0.37	0/3650
All	All	0.21	0/17828	0.38	0/24132

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

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	3488	0	3441	18	0
1	C	3489	0	3413	20	0
2	B	3374	0	3270	22	0
2	D	3326	0	3221	16	0
3	E	1016	0	1041	2	0
4	F	2633	0	2631	18	0
5	A	32	0	12	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
5	C	32	0	12	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
6	F	1	0	0	0	0
7	A	18	0	24	1	0
7	B	24	0	32	1	0
7	C	18	0	24	0	0
7	D	12	0	16	2	0
7	E	6	0	8	0	0
8	A	1	0	0	0	0
8	B	1	0	0	0	0
8	C	1	0	0	0	0
9	B	28	0	12	0	0
9	D	28	0	12	1	0
10	B	29	0	25	1	0
10	D	29	0	25	0	0
11	B	12	0	12	1	0
12	C	14	0	20	0	0
13	C	15	0	15	0	0
14	F	31	0	14	1	0
15	A	127	0	0	0	0
15	B	132	0	0	3	0
15	C	219	0	0	1	0
15	D	84	0	0	1	0
15	E	29	0	0	1	0
15	F	35	0	0	1	0
All	All	18288	0	17280	93	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.

The worst 5 of 93 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)
2:B:264:ARG:HH12	2:B:424[B]:ASN:HD21	1.40	0.69
2:D:175:PRO:HA	2:D:178:SER:HB2	1.76	0.67
2:D:158:ARG:NH1	7:D:505:GOL:O2	2.30	0.65
1:C:210:TYR:OH	1:C:221:ARG:NH2	2.31	0.64
3:E:108[A]:ASN:ND2	15:E:301:HOH:O	2.30	0.64

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	450/451 (100%)	438 (97%)	12 (3%)	0	100	100
1	C	449/451 (100%)	440 (98%)	9 (2%)	0	100	100
2	B	429/445 (96%)	420 (98%)	9 (2%)	0	100	100
2	D	421/445 (95%)	406 (96%)	15 (4%)	0	100	100
3	E	120/143 (84%)	120 (100%)	0	0	100	100
4	F	307/384 (80%)	293 (95%)	14 (5%)	0	100	100
All	All	2176/2319 (94%)	2117 (97%)	59 (3%)	0	100	100

There are no Ramachandran outliers to report.

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	383/379 (101%)	383 (100%)	0	100	100
1	C	382/379 (101%)	381 (100%)	1 (0%)	92	97
2	B	375/383 (98%)	372 (99%)	3 (1%)	81	91
2	D	368/383 (96%)	363 (99%)	5 (1%)	67	81
3	E	112/127 (88%)	112 (100%)	0	100	100
4	F	293/342 (86%)	290 (99%)	3 (1%)	76	87

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
All	All	1913/1993 (96%)	1901 (99%)	12 (1%)	86 94

5 of 12 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	D	180	THR
2	D	345	GLU
4	F	125	THR
4	F	89	GLU
1	C	335	ILE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (4) such sidechains are listed below:

Mol	Chain	Res	Type
2	B	247	GLN
1	C	133	GLN
1	C	406	HIS
3	E	18	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 monosaccharides in this entry.

5.6 Ligand geometry (i)

Of 34 ligands modelled in this entry, 8 are monoatomic - leaving 26 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	$\#\|Z\| > 2$
9	GDP	D	501	6	24,30,30	0.94	1 (4%)	30,47,47	1.19	4 (13%)
7	GOL	A	503	-	5,5,5	0.42	0	5,5,5	0.23	0
12	PEG	C	507	-	6,6,6	0.42	0	5,5,5	0.30	0
7	GOL	B	507	-	5,5,5	0.40	0	5,5,5	0.20	0
7	GOL	A	505	-	5,5,5	0.36	0	5,5,5	0.30	0
5	GTP	A	501	6	26,34,34	1.12	2 (7%)	32,54,54	1.44	6 (18%)
7	GOL	D	504	-	5,5,5	0.35	0	5,5,5	0.26	0
7	GOL	C	503	-	5,5,5	0.37	0	5,5,5	0.29	0
10	LOC	B	503	-	31,31,31	1.88	6 (19%)	44,44,44	1.78	8 (18%)
13	IMD	C	509	-	3,5,5	0.41	0	4,5,5	0.59	0
13	IMD	C	511	-	3,5,5	0.42	0	4,5,5	0.57	0
7	GOL	C	505	-	5,5,5	0.37	0	5,5,5	0.23	0
7	GOL	D	505	-	5,5,5	0.37	0	5,5,5	0.27	0
5	GTP	C	501	6	26,34,34	1.13	2 (7%)	32,54,54	1.43	6 (18%)
14	ACP	F	402	6	27,33,33	1.73	7 (25%)	32,52,52	1.54	4 (12%)
7	GOL	E	201	-	5,5,5	0.35	0	5,5,5	0.29	0
12	PEG	C	506	-	6,6,6	0.44	0	5,5,5	0.28	0
10	LOC	D	503	-	31,31,31	1.89	6 (19%)	44,44,44	1.82	8 (18%)
7	GOL	A	504	-	5,5,5	0.37	0	5,5,5	0.27	0
7	GOL	B	504	-	5,5,5	0.35	0	5,5,5	0.28	0
13	IMD	C	510	-	3,5,5	0.42	0	4,5,5	0.56	0
9	GDP	B	501	6	24,30,30	0.96	1 (4%)	30,47,47	1.12	3 (10%)
7	GOL	B	505	-	5,5,5	0.37	0	5,5,5	0.26	0
11	MES	B	509	-	12,12,12	2.26	1 (8%)	14,16,16	1.94	6 (42%)
7	GOL	C	504	-	5,5,5	0.38	0	5,5,5	0.20	0
7	GOL	B	506	-	5,5,5	0.36	0	5,5,5	0.26	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
9	GDP	D	501	6	-	5/12/32/32	0/3/3/3
7	GOL	A	503	-	-	2/4/4/4	-
12	PEG	C	507	-	-	0/4/4/4	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
7	GOL	B	507	-	-	2/4/4/4	-
7	GOL	A	505	-	-	2/4/4/4	-
5	GTP	A	501	6	-	6/18/38/38	0/3/3/3
7	GOL	D	504	-	-	2/4/4/4	-
7	GOL	C	503	-	-	2/4/4/4	-
10	LOC	B	503	-	-	0/12/25/25	0/3/3/3
13	IMD	C	509	-	-	-	0/1/1/1
13	IMD	C	511	-	-	-	0/1/1/1
7	GOL	C	505	-	-	2/4/4/4	-
7	GOL	D	505	-	-	2/4/4/4	-
5	GTP	C	501	6	-	7/18/38/38	0/3/3/3
14	ACP	F	402	6	-	8/15/38/38	0/3/3/3
7	GOL	E	201	-	-	2/4/4/4	-
12	PEG	C	506	-	-	0/4/4/4	-
10	LOC	D	503	-	-	0/12/25/25	0/3/3/3
7	GOL	A	504	-	-	2/4/4/4	-
7	GOL	B	504	-	-	2/4/4/4	-
13	IMD	C	510	-	-	-	0/1/1/1
9	GDP	B	501	6	-	5/12/32/32	0/3/3/3
7	GOL	B	505	-	-	2/4/4/4	-
11	MES	B	509	-	-	0/6/14/14	0/1/1/1
7	GOL	C	504	-	-	4/4/4/4	-
7	GOL	B	506	-	-	2/4/4/4	-

The worst 5 of 26 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
11	B	509	MES	C8-S	-7.55	1.66	1.77
10	B	503	LOC	O6-C17	5.50	1.45	1.35
10	D	503	LOC	O6-C17	5.48	1.45	1.35
10	D	503	LOC	C1-C3	4.31	1.48	1.39
10	B	503	LOC	C1-C3	4.28	1.48	1.39

The worst 5 of 45 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
10	D	503	LOC	O6-C17-C16	7.64	117.01	109.56
10	B	503	LOC	O6-C17-C16	7.58	116.95	109.56

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
14	F	402	ACP	N3-C2-N1	-4.44	121.73	128.68
11	B	509	MES	C5-N4-C3	4.05	117.96	108.83
10	D	503	LOC	C14-C11-N1	-3.73	111.40	114.34

There are no chirality outliers.

5 of 59 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	A	501	GTP	C5'-O5'-PA-O1A
5	A	501	GTP	C5'-O5'-PA-O2A
5	C	501	GTP	C5'-O5'-PA-O1A
5	C	501	GTP	C5'-O5'-PA-O2A
7	A	504	GOL	O1-C1-C2-C3

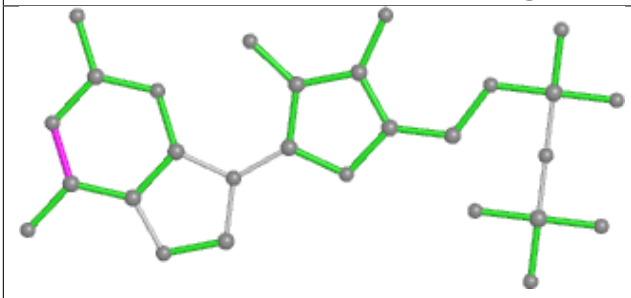
There are no ring outliers.

7 monomers are involved in 8 short contacts:

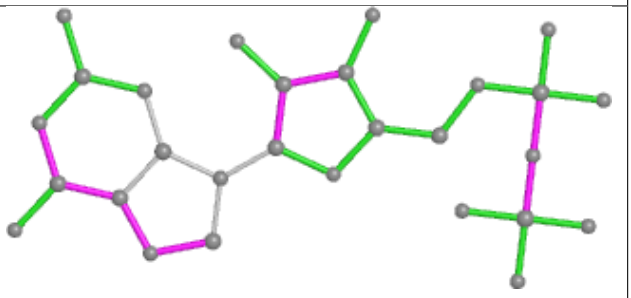
Mol	Chain	Res	Type	Clashes	Symm-Clashes
9	D	501	GDP	1	0
7	B	507	GOL	1	0
7	A	505	GOL	1	0
10	B	503	LOC	1	0
7	D	505	GOL	2	0
14	F	402	ACP	1	0
11	B	509	MES	1	0

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.

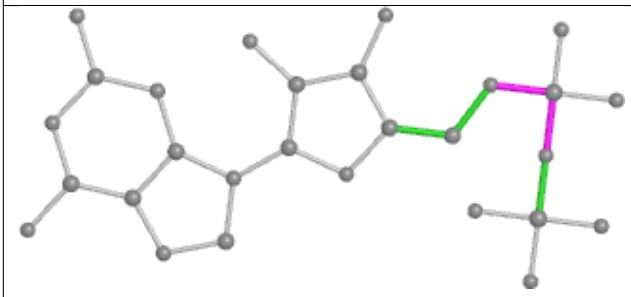
Ligand GDP D 501



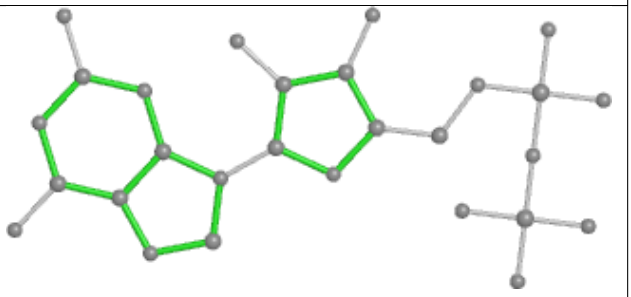
Bond lengths



Bond angles

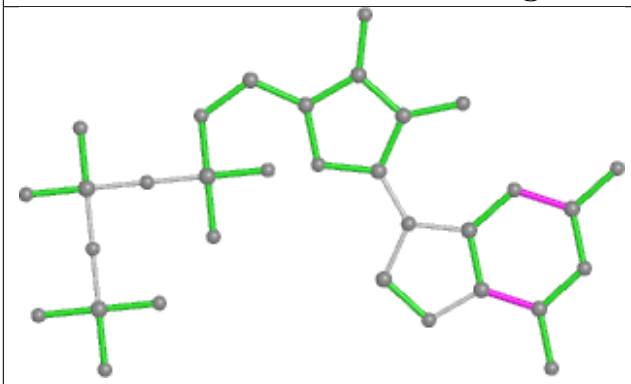


Torsions



Rings

Ligand GTP A 501



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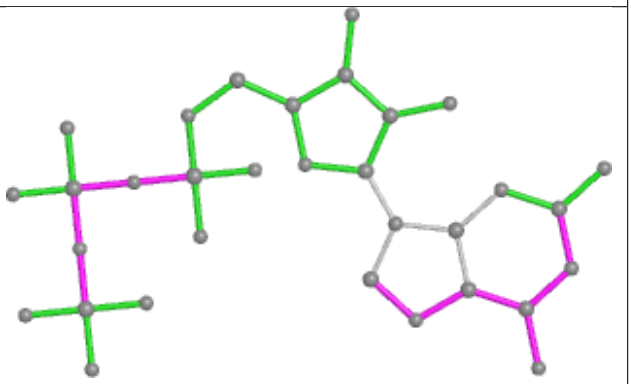

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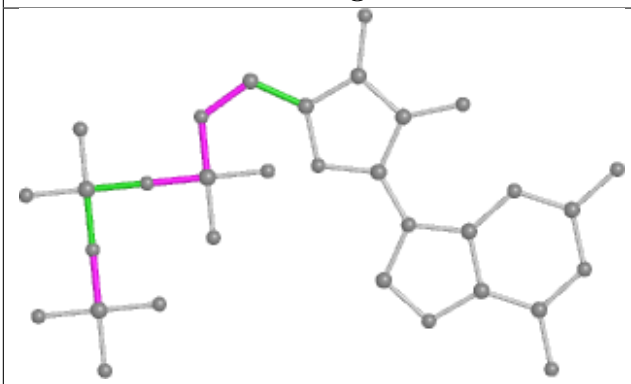

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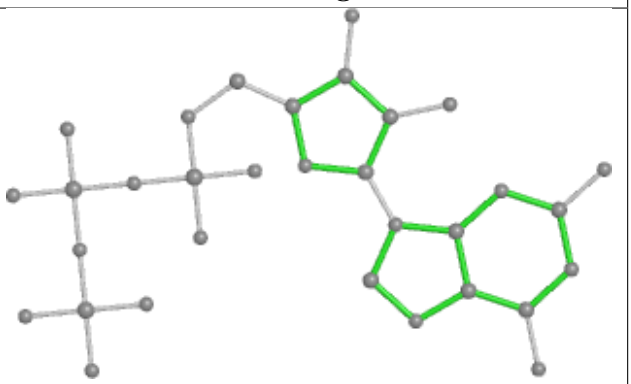
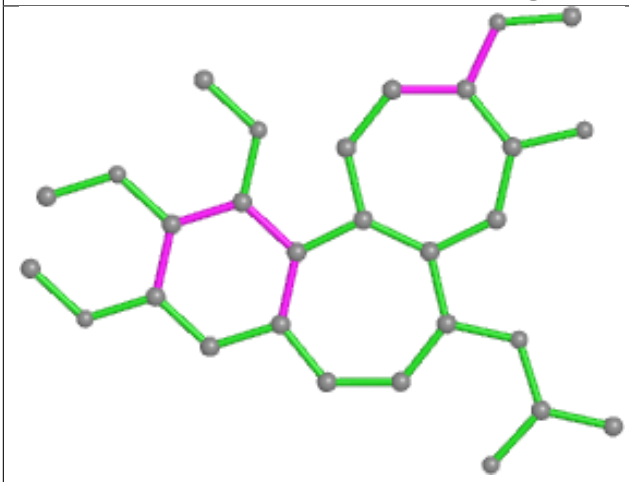


Rings

Ligand LOC B 503



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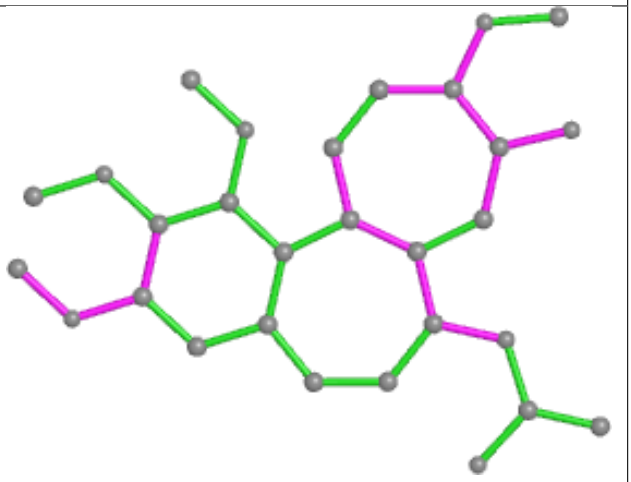

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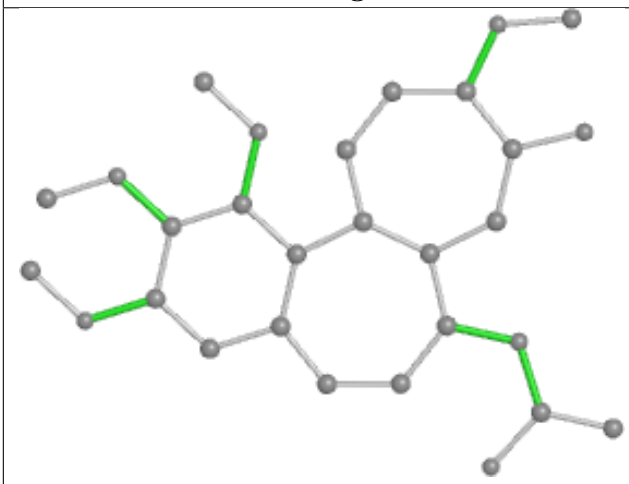

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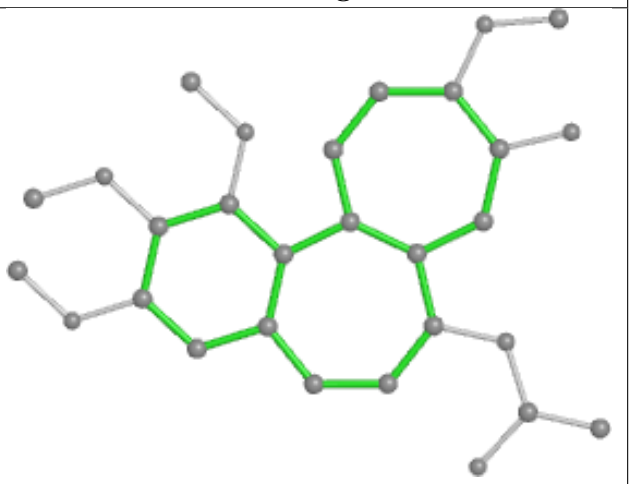
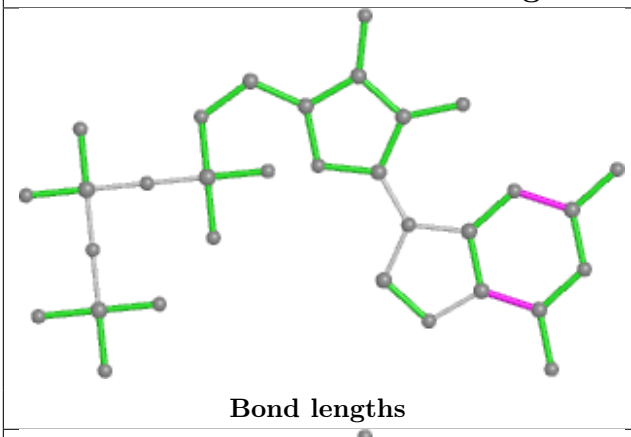


Rings

Ligand GTP C 501



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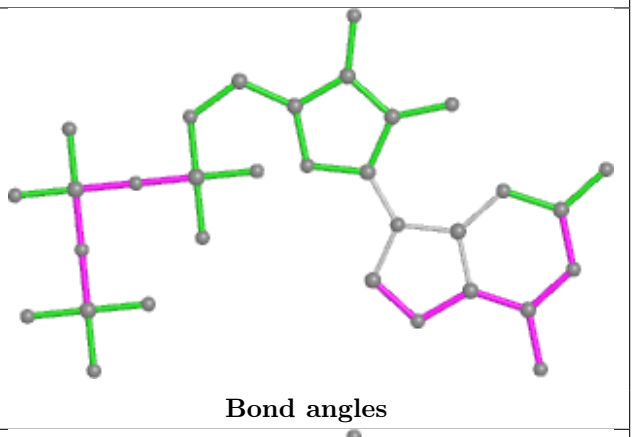

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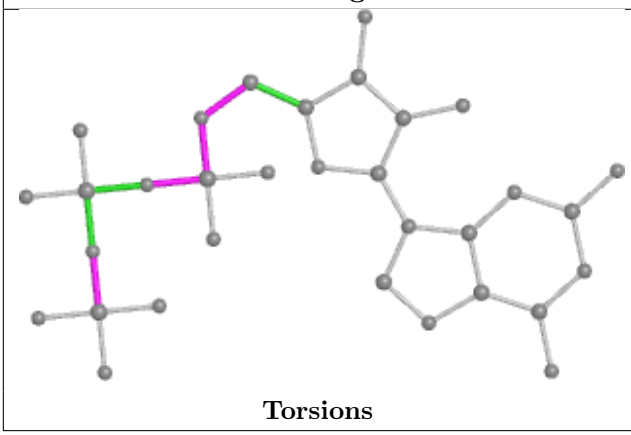

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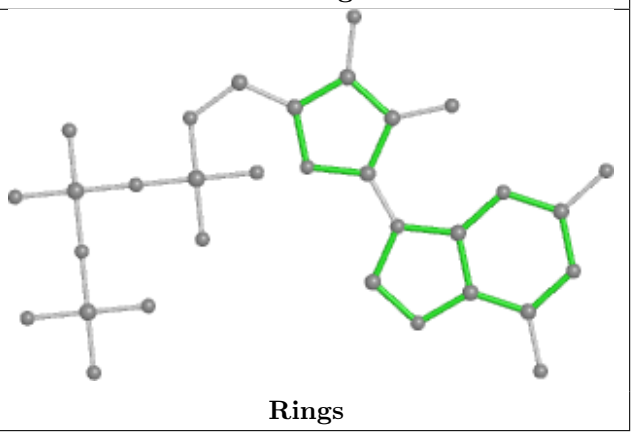
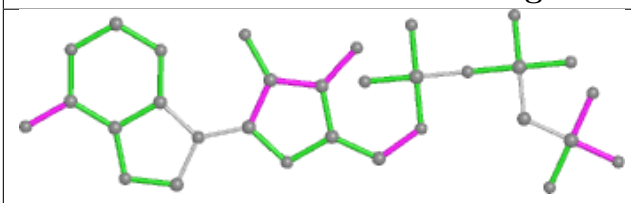


Rings

Ligand ACP F 402



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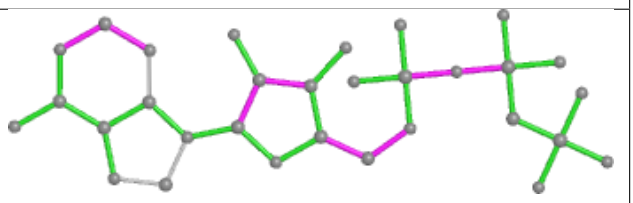

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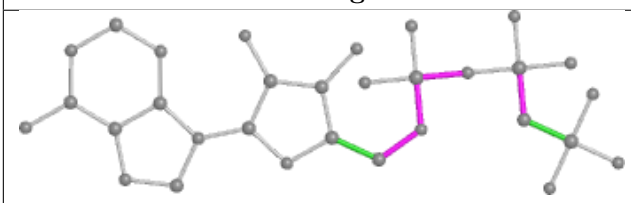

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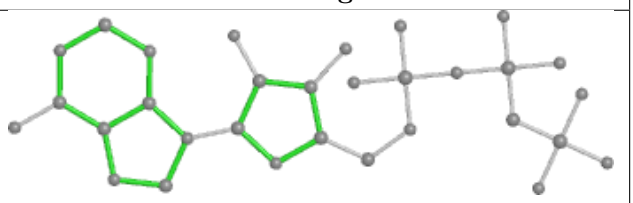
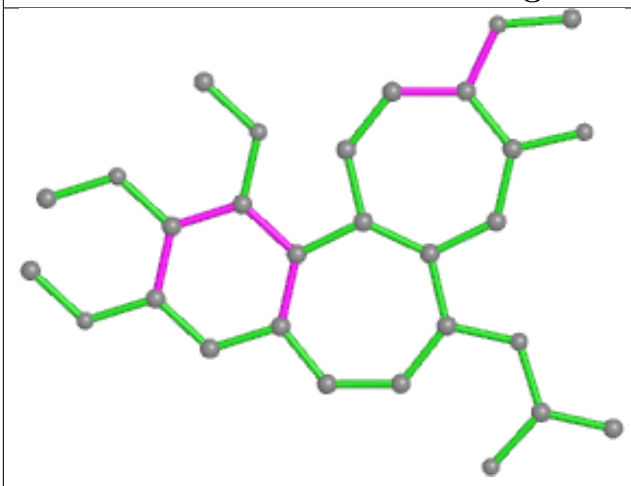


Rings

Ligand LOC D 503



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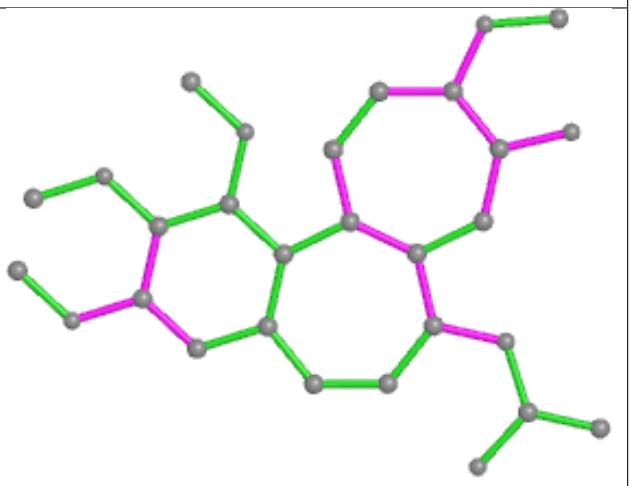
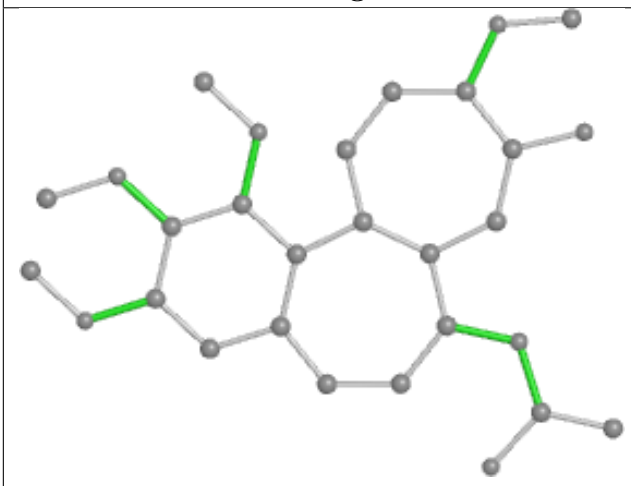


Bond angles



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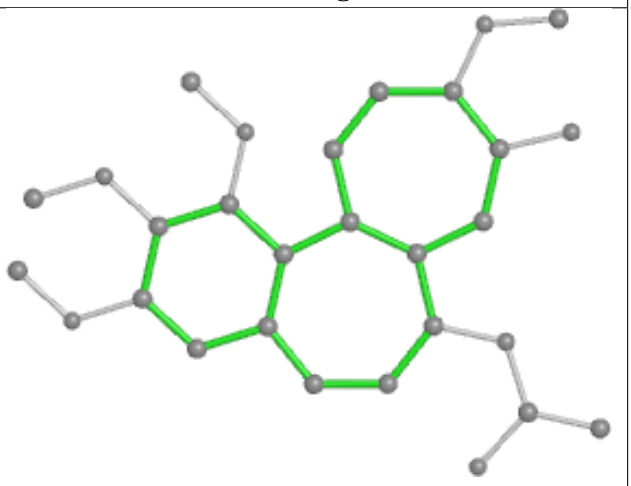
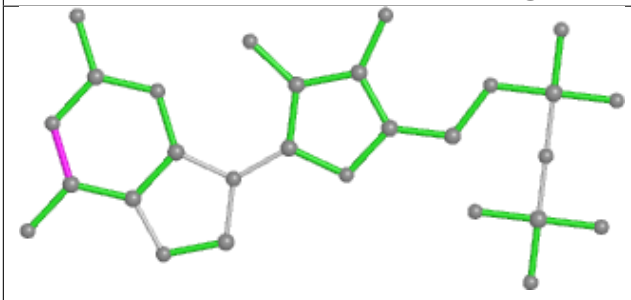
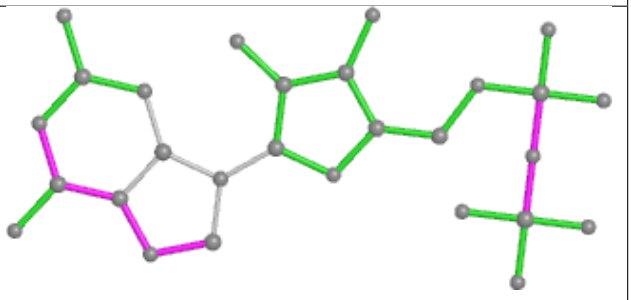


Rings

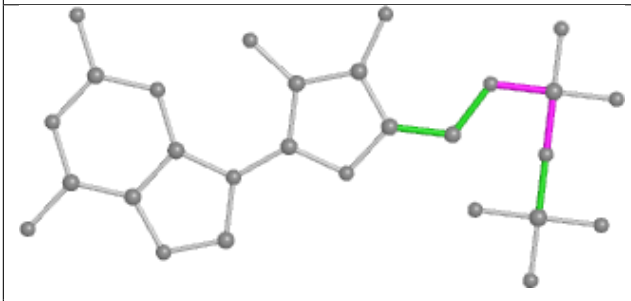
Ligand GDP B 501



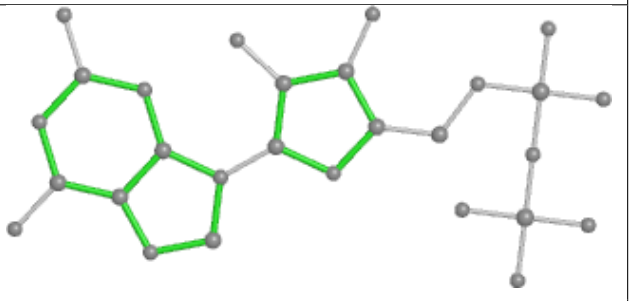
Bond lengths



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

6.1 Protein, DNA and RNA chains

In the following table, the column labelled '#RSRZ> 2' contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95^{th} 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	439/451 (97%)	-0.07	2 (0%) 91 94	30, 47, 85, 126	0
1	C	440/451 (97%)	0.08	1 (0%) 95 96	22, 36, 66, 90	0
2	B	422/445 (94%)	0.03	3 (0%) 87 91	25, 43, 75, 123	1 (0%)
2	D	421/445 (94%)	0.10	14 (3%) 46 53	30, 56, 89, 111	4 (0%)
3	E	121/143 (84%)	0.43	6 (4%) 28 35	35, 64, 104, 117	0
4	F	319/384 (83%)	1.15	74 (23%) 0 1	43, 74, 132, 155	0
All	All	2162/2319 (93%)	0.22	100 (4%) 32 39	22, 50, 98, 155	5 (0%)

The worst 5 of 100 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
4	F	249	TYR	9.9
4	F	173	ILE	8.2
4	F	130	VAL	7.8
4	F	244	CYS	6.9
4	F	240	LEU	6.5

6.2 Non-standard residues in protein, DNA, RNA chains

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

6.3 Carbohydrates

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, 95^{th} 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.

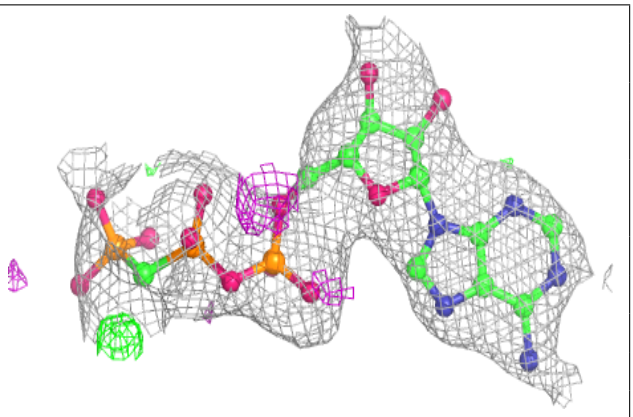
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
7	GOL	E	201	6/6	0.63	0.18	70,82,85,86	0
12	PEG	C	507	7/7	0.64	0.32	94,95,98,98	0
7	GOL	B	507	6/6	0.71	0.50	89,97,98,100	0
12	PEG	C	506	7/7	0.72	0.24	56,74,84,84	0
7	GOL	B	504	6/6	0.75	0.26	68,77,79,81	0
7	GOL	B	505	6/6	0.80	0.28	76,86,86,88	0
13	IMD	C	511	5/5	0.81	0.20	78,79,81,81	0
6	MG	A	502	1/1	0.83	0.19	33,33,33,33	0
7	GOL	D	505	6/6	0.84	0.23	71,74,77,79	0
8	CA	C	508	1/1	0.85	0.15	95,95,95,95	0
7	GOL	C	505	6/6	0.85	0.22	63,72,74,76	0
6	MG	D	502	1/1	0.86	0.07	54,54,54,54	0
7	GOL	A	505	6/6	0.86	0.24	71,78,83,85	0
7	GOL	D	504	6/6	0.87	0.21	76,79,80,80	0
13	IMD	C	510	5/5	0.88	0.25	84,85,86,86	0
7	GOL	B	506	6/6	0.88	0.18	72,73,74,75	0
7	GOL	A	504	6/6	0.89	0.17	69,71,73,74	0
7	GOL	C	504	6/6	0.90	0.27	60,72,75,79	0
11	MES	B	509	12/12	0.90	0.16	58,68,87,94	0
7	GOL	A	503	6/6	0.91	0.30	67,72,77,77	0
14	ACP	F	402	31/31	0.91	0.17	67,84,150,199	0
8	CA	A	506	1/1	0.92	0.11	75,75,75,75	0
7	GOL	C	503	6/6	0.92	0.28	62,64,70,75	0
6	MG	F	401	1/1	0.94	0.07	77,77,77,77	0
8	CA	B	508	1/1	0.94	0.14	127,127,127,127	0
13	IMD	C	509	5/5	0.94	0.14	52,54,55,55	0
9	GDP	D	501	28/28	0.95	0.14	42,49,60,65	0
10	LOC	D	503	29/29	0.96	0.14	29,34,42,45	0
6	MG	C	502	1/1	0.97	0.14	26,26,26,26	0
10	LOC	B	503	29/29	0.97	0.13	30,35,40,42	0
5	GTP	C	501	32/32	0.98	0.14	19,24,33,41	0
9	GDP	B	501	28/28	0.98	0.16	20,30,37,37	0
5	GTP	A	501	32/32	0.98	0.14	20,32,38,52	0
6	MG	B	502	1/1	0.99	0.15	22,22,22,22	0

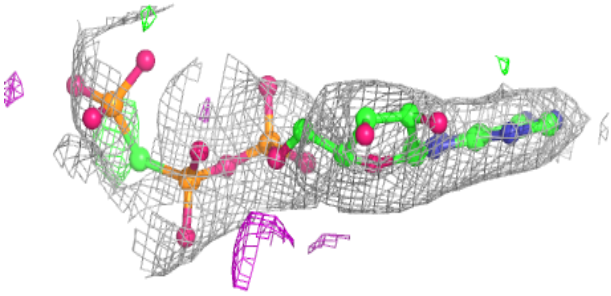
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers

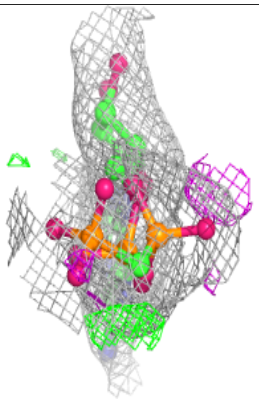
as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.

Electron density around ACP F 402:

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

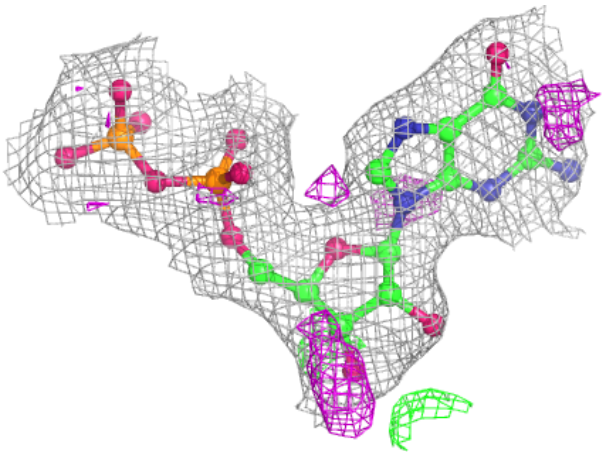


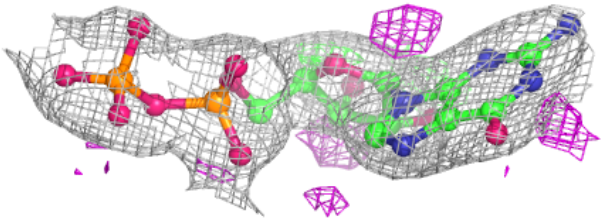


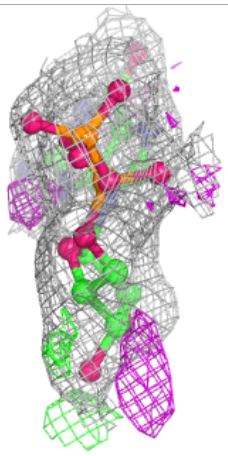


Electron density around GDP D 501:

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

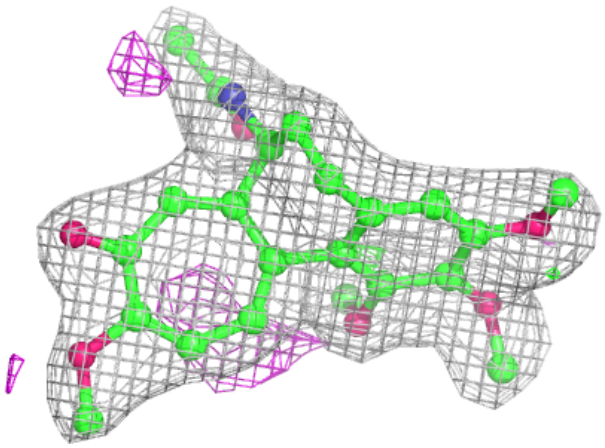


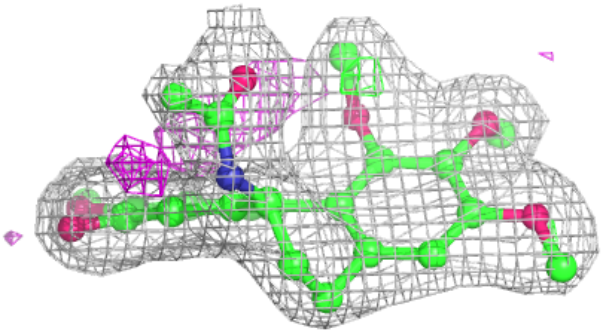


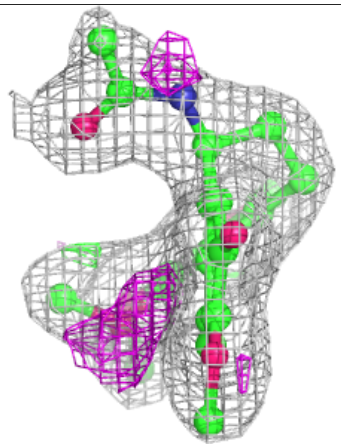


Electron density around LOC D 503:

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

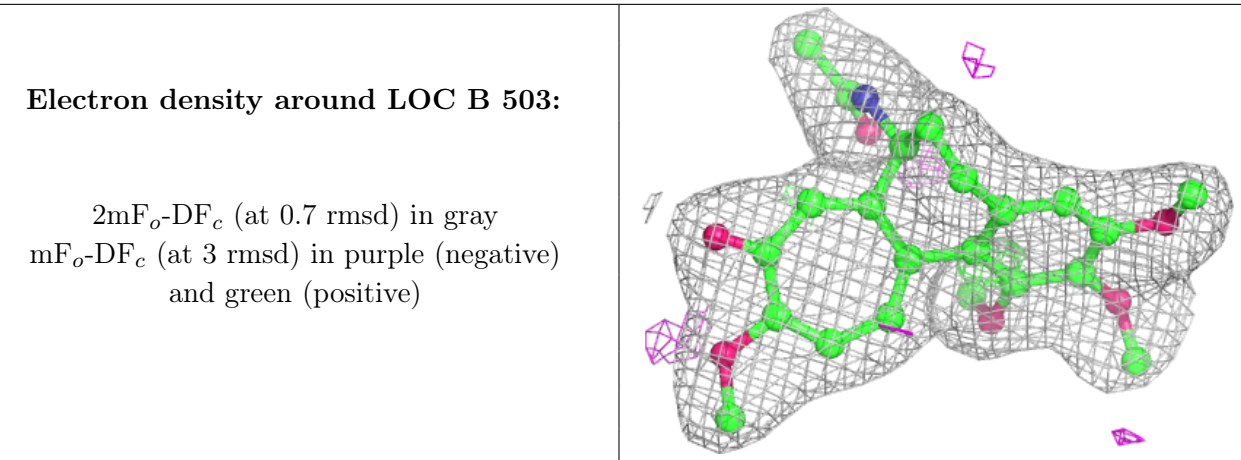


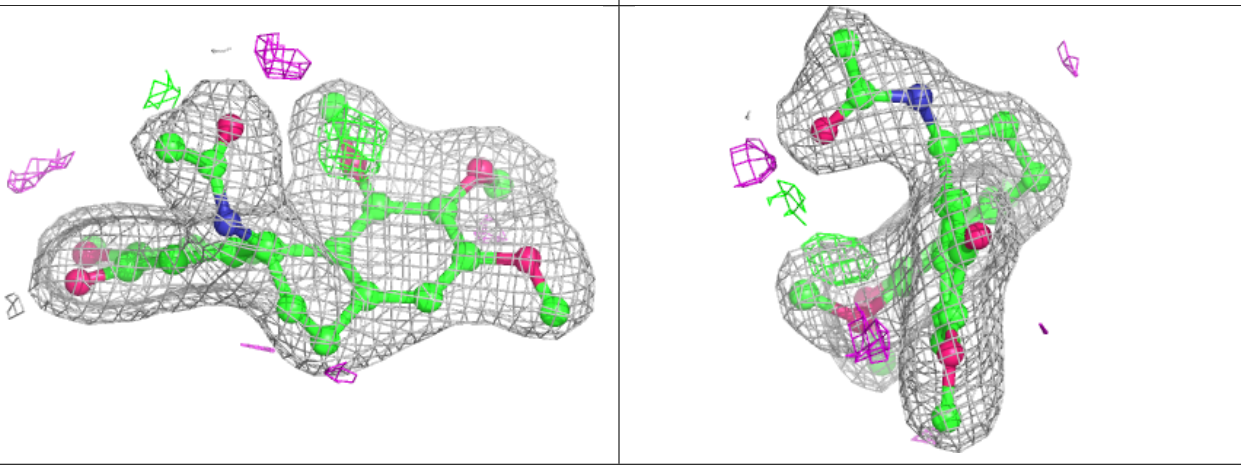




Electron density around LOC B 503:

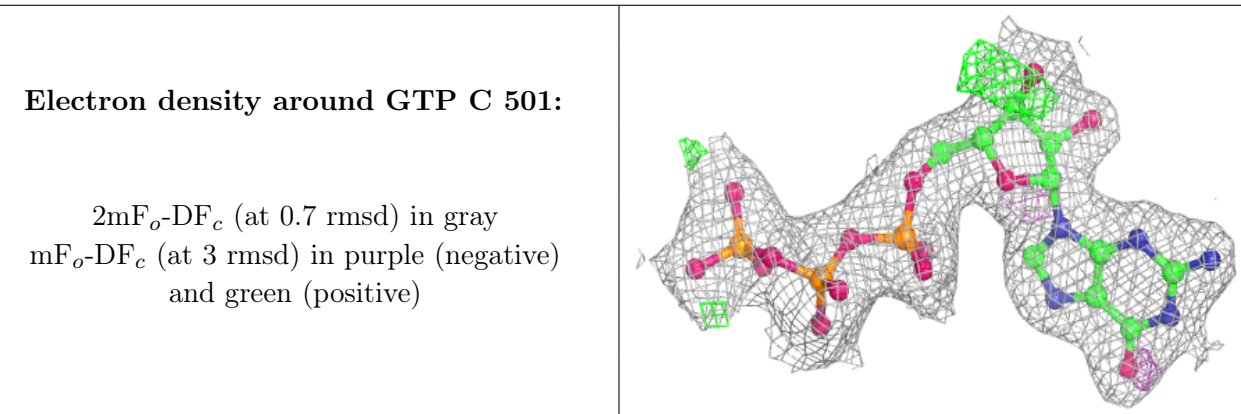
$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)

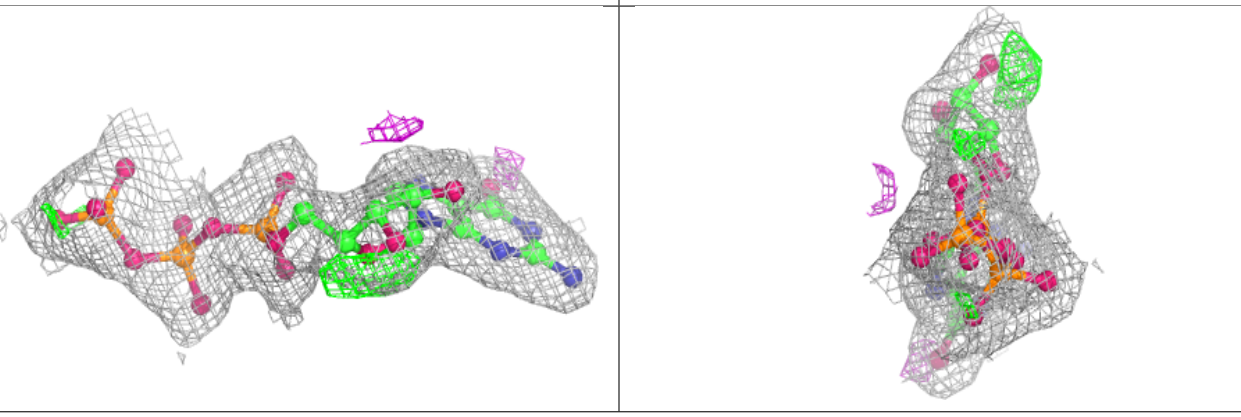




Electron density around GTP C 501:

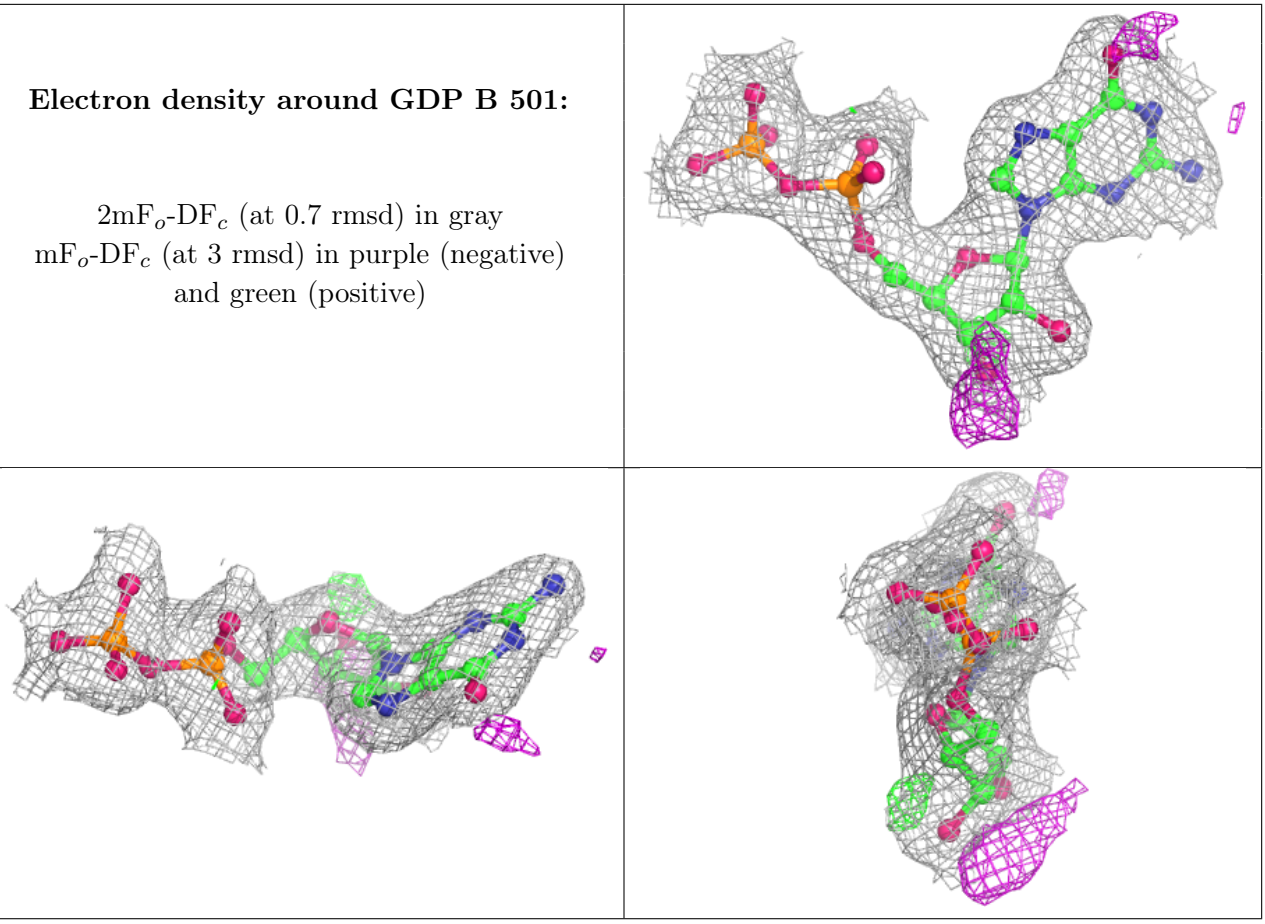
$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)





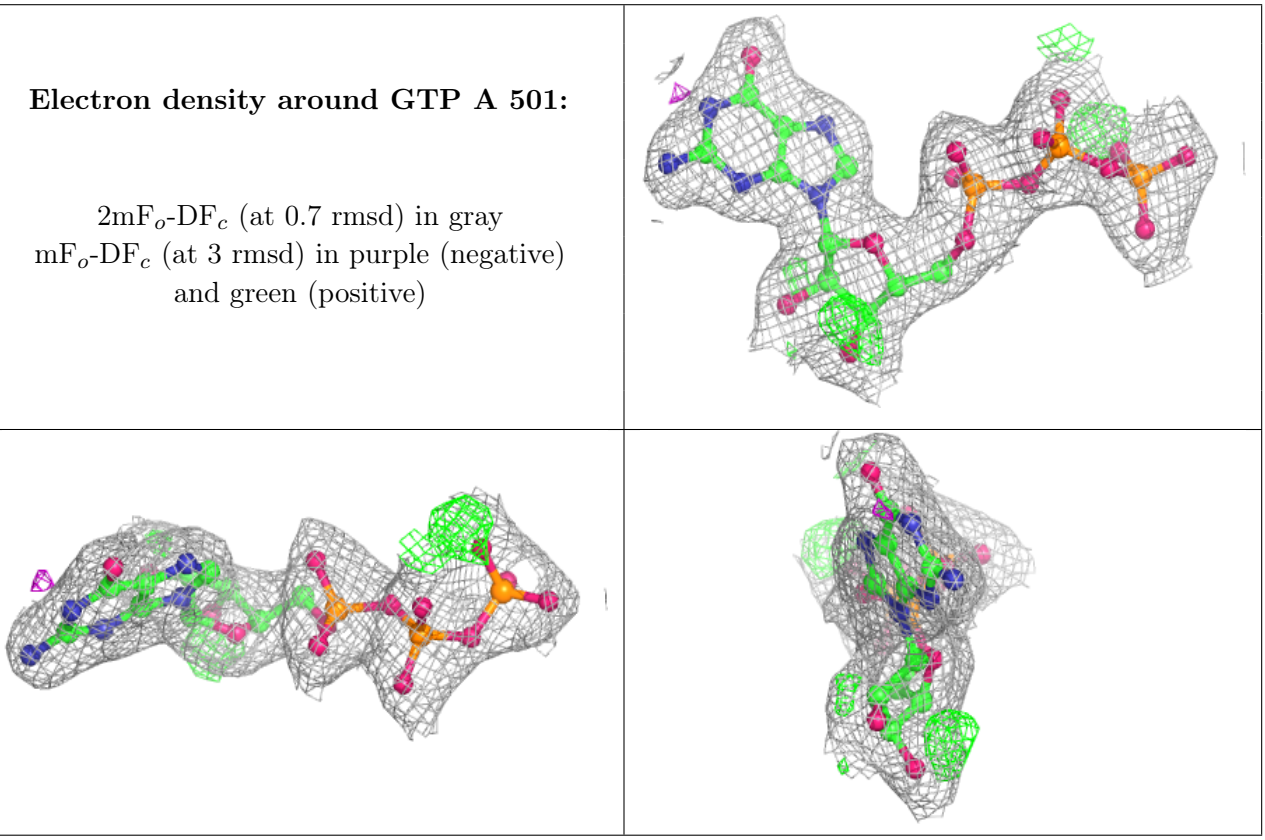
Electron density around GDP B 501:

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



Electron density around GTP A 501:

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



6.5 Other polymers (i)

There are no such residues in this entry.