



# Full wwPDB X-ray Structure Validation Report ⓘ

Jun 30, 2025 – 04:09 PM EDT

PDB ID : 9MG3 / pdb\_00009mg3  
Title : Structure of Kluyveromyces lactis mRNA cap (guanine-N7) methyltransferase, Abd1, in complex with sinefungin and GTP  
Authors : Nilson, D.J.; Fedorov, E.; Ghosh, A.  
Deposited on : 2024-12-10  
Resolution : 1.42 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](mailto: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>.

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

MolProbity : 4-5-2 with Phenix2.0rc1  
Mogul : 2022.3.0, CSD as543be (2022)  
Xtriage (Phenix) : 2.0rc1  
EDS : 3.0  
buster-report : 1.1.7 (2018)  
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)  
CCP4 : 9.0.006 (Gargrove)  
Density-Fitness : 1.0.12  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.44

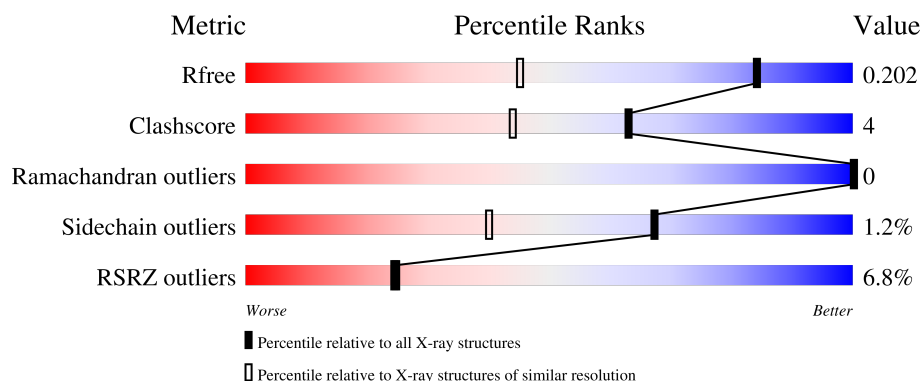
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.42 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	3500 (1.44-1.40)
Clashscore	180529	3801 (1.44-1.40)
Ramachandran outliers	177936	3734 (1.44-1.40)
Sidechain outliers	177891	3733 (1.44-1.40)
RSRZ outliers	164620	3499 (1.44-1.40)

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  $\geq 3$ , 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	289	<div> <div>9%</div> <div>92%</div> <div>8%</div> </div>
1	B	289	<div> <div>4%</div> <div>92%</div> <div>7%</div> </div>

## 2 Entry composition [i](#)

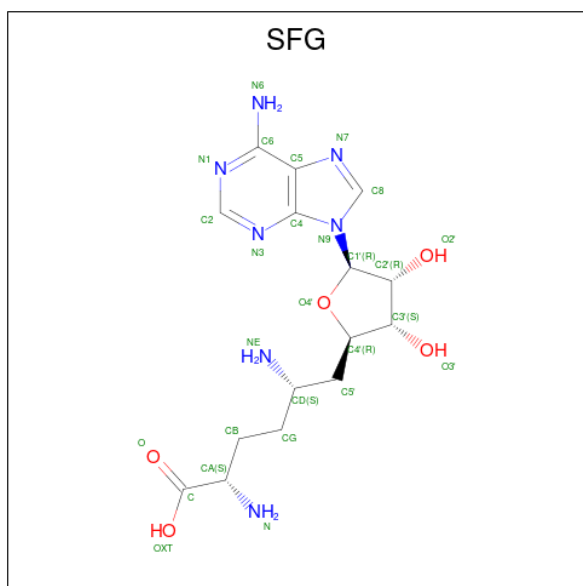
There are 7 unique types of molecules in this entry. The entry contains 10221 atoms, of which 4746 are hydrogens and 0 are deuteriums.

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 mRNA cap guanine-N(7) methyltransferase.

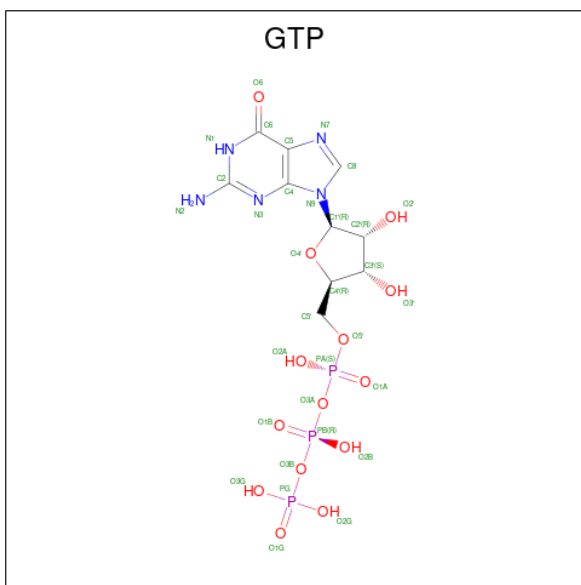
Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	288	Total	C	H	N	O	S	0	13	0
			4743	1553	2345	390	443	12			
1	B	289	Total	C	H	N	O	S	0	10	0
			4743	1555	2342	388	446	12			

- Molecule 2 is SINEFUNGIN (CCD ID: SFG) (formula:  $C_{15}H_{23}N_7O_5$ ) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total	C	H	N	O	0	0
			34	15	7	7	5		
2	B	1	Total	C	H	N	O	0	0
			35	15	8	7	5		

- Molecule 3 is GUANOSINE-5'-TRIPHOSPHATE (CCD ID: GTP) (formula:  $C_{10}H_{16}N_5O_{14}P_3$ ) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms						ZeroOcc	AltConf
3	A	1	Total 42	C 10	H 10	N 5	O 14	P 3	0	0
3	B	1	Total 42	C 10	H 10	N 5	O 14	P 3	0	0

- Molecule 4 is SODIUM ION (CCD ID: NA) (formula: Na).

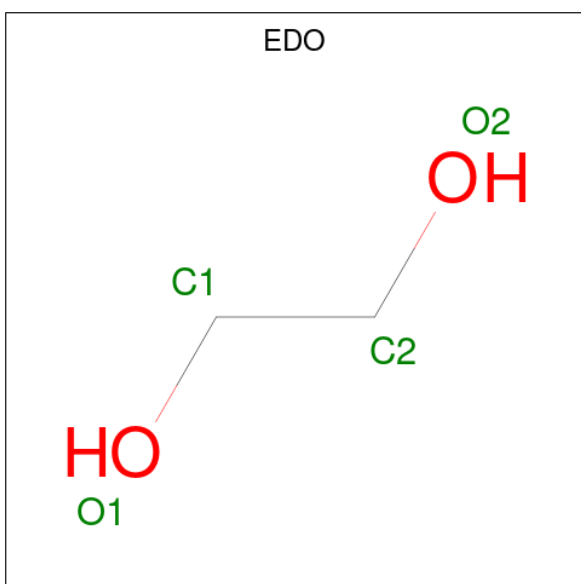
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	5	Total Na 5 5	0	0
4	B	5	Total Na 5 5	0	0

- Molecule 5 is SULFATE ION (CCD ID: SO4) (formula:  $\text{O}_4\text{S}$ ).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	A	1	Total	O	S	0	0
			5	4	1		
5	A	1	Total	O	S	0	0
			5	4	1		
5	A	1	Total	O	S	0	0
			5	4	1		
5	B	1	Total	O	S	0	0
			5	4	1		
5	B	1	Total	O	S	0	0
			5	4	1		

- Molecule 6 is 1,2-ETHANEDIOL (CCD ID: EDO) (formula: C<sub>2</sub>H<sub>6</sub>O<sub>2</sub>).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	A	1	Total C H O 10 2 6 2	0	0
6	B	1	Total C H O 10 2 6 2	0	0
6	B	1	Total C H O 10 2 6 2	0	0
6	B	1	Total C H O 10 2 6 2	0	0

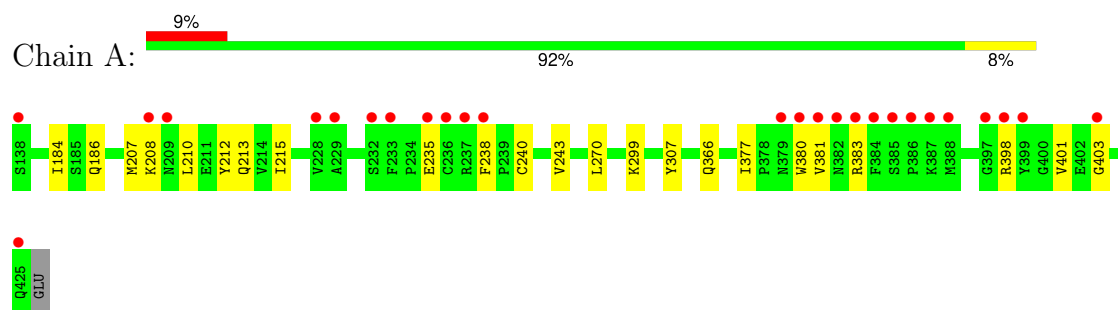
- Molecule 7 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
7	A	240	Total O 243 243	0	3
7	B	262	Total O 264 264	0	2

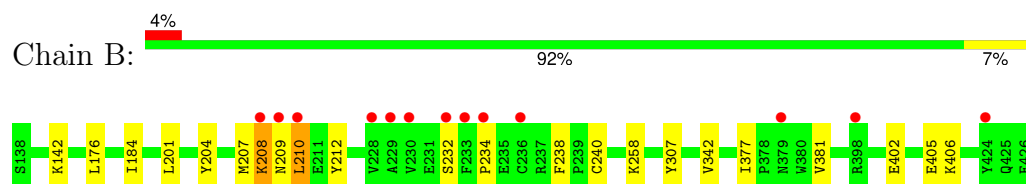
### 3 Residue-property plots [i](#)

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: mRNA cap guanine-N(7) methyltransferase



- Molecule 1: mRNA cap guanine-N(7) methyltransferase



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	65.04Å 92.61Å 101.30Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	39.96 – 1.42 39.96 – 1.42	Depositor EDS
% Data completeness (in resolution range)	98.9 (39.96-1.42) 99.2 (39.96-1.42)	Depositor EDS
$R_{merge}$	0.09	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.39 (at 1.42Å)	Xtriage
Refinement program	PHENIX (1.21rc1_5156)	Depositor
R, $R_{free}$	0.174 , 0.201 0.175 , 0.202	Depositor DCC
$R_{free}$ test set	5731 reflections (4.94%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	14.0	Xtriage
Anisotropy	0.919	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.41 , 36.6	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.50$ , $\langle L^2 \rangle = 0.34$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
$F_o, F_c$ correlation	0.97	EDS
Total number of atoms	10221	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	25.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 46.98 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 1.0601e-04. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical 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

### 5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: GTP, EDO, NA, SO4, SFG

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	0.39	0/2501	0.57	0/3375
1	B	0.42	1/2491 (0.0%)	0.66	2/3360 (0.1%)
All	All	0.41	1/4992 (0.0%)	0.62	2/6735 (0.0%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	1

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	258	LYS	C-O	-5.07	1.18	1.24

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	209	ASN	CB-CA-C	13.09	128.38	111.50
1	B	208	LYS	CB-CA-C	5.02	119.98	112.31

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	383	ARG	Sidechain

## 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	2398	2345	2320	16	0
1	B	2401	2342	2333	20	0
2	A	27	7	22	1	0
2	B	27	8	22	1	0
3	A	32	10	12	0	0
3	B	32	10	12	0	0
4	A	5	0	0	0	0
4	B	5	0	0	0	0
5	A	15	0	0	1	0
5	B	10	0	0	0	0
6	A	4	6	6	0	0
6	B	12	18	18	1	0
7	A	243	0	0	2	0
7	B	264	0	0	4	0
All	All	5475	4746	4745	38	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 4.

All (38) 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:B:210:LEU:CD1	1:B:212[A]:TYR:CZ	2.34	1.11
1:B:210:LEU:HD12	1:B:212[A]:TYR:CZ	2.05	0.91
1:B:210:LEU:HD13	1:B:212[A]:TYR:CE1	2.13	0.82
1:B:210:LEU:HD13	1:B:212[A]:TYR:CZ	2.14	0.82
1:B:210:LEU:CD1	1:B:212[A]:TYR:OH	2.29	0.79
1:B:210:LEU:HD11	1:B:212[A]:TYR:OH	1.88	0.74
1:B:210:LEU:HD12	1:B:212[A]:TYR:CE2	2.32	0.64
1:B:342[B]:VAL:HG23	7:B:666:HOH:O	1.99	0.63
1:B:176[A]:LEU:HD23	1:B:207:MET:HE1	1.81	0.62
1:B:210:LEU:CD1	1:B:212[A]:TYR:CE1	2.78	0.57
1:B:377:ILE:O	1:B:381:VAL:HG23	2.05	0.56
2:A:501:SFG:H4'	2:A:501:SFG:HB1	1.88	0.56
1:A:215:ILE:HD11	1:A:235:GLU:HG2	1.88	0.55

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:184:ILE:HD11	1:B:212[B]:TYR:CE1	2.42	0.54
1:A:186:GLN:HE21	1:A:213:GLN:CD	2.17	0.53
1:A:398:ARG:NH2	5:A:510:SO4:O2	2.45	0.50
1:A:377:ILE:HG13	1:A:381:VAL:HG23	1.93	0.50
2:B:501:SFG:H4'	2:B:501:SFG:HB1	1.92	0.50
6:B:512:EDO:H21	7:B:786:HOH:O	2.11	0.49
1:B:142:LYS:HD3	7:B:807:HOH:O	2.12	0.49
1:A:215:ILE:HD11	1:A:235:GLU:CG	2.43	0.49
1:A:208:LYS:N	1:A:208:LYS:CD	2.77	0.48
1:B:342[B]:VAL:CG2	7:B:666:HOH:O	2.60	0.48
1:A:207:MET:HE2	1:A:210:LEU:HD21	1.95	0.48
1:A:366:GLN:NE2	7:A:604:HOH:O	2.37	0.48
1:A:299:LYS:NZ	7:A:608:HOH:O	2.47	0.47
1:A:243:VAL:HG23	1:A:270:LEU:HD13	1.96	0.46
1:A:403:GLY:O	1:B:406:LYS:NZ	2.49	0.46
1:B:204:TYR:HA	1:B:207:MET:HE2	1.98	0.46
1:A:215:ILE:CD1	1:A:235:GLU:HG2	2.46	0.45
1:A:380:TRP:O	1:A:381:VAL:C	2.59	0.44
1:B:402:GLU:O	1:B:405[A]:GLU:OE2	2.36	0.44
1:B:176[A]:LEU:HD23	1:B:207:MET:CE	2.47	0.43
1:B:232:SER:C	1:B:234:PRO:HD3	2.44	0.43
1:A:184:ILE:HD11	1:A:212[B]:TYR:CD2	2.54	0.43
1:B:238:PHE:CE1	1:B:240[B]:CYS:SG	3.13	0.42
1:A:238:PHE:CE1	1:A:240[B]:CYS:SG	3.14	0.41
1:A:208:LYS:H	1:A:208:LYS:HD3	1.86	0.40

There are no symmetry-related clashes.

## 5.3 Torsion angles ⓘ

### 5.3.1 Protein backbone ⓘ

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

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

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	299/289 (104%)	293 (98%)	6 (2%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	B	297/289 (103%)	293 (99%)	4 (1%)	0	100	100
All	All	596/578 (103%)	586 (98%)	10 (2%)	0	100	100

There are no Ramachandran outliers to report.

### 5.3.2 Protein sidechains ⓘ

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	261/251 (104%)	259 (99%)	2 (1%)	79	57
1	B	260/251 (104%)	256 (98%)	4 (2%)	60	31
All	All	521/502 (104%)	515 (99%)	6 (1%)	67	40

All (6) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	307	TYR
1	A	401	VAL
1	B	201	LEU
1	B	208	LYS
1	B	210	LEU
1	B	307	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	186	GLN
1	A	379	ASN

### 5.3.3 RNA ⓘ

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 23 ligands modelled in this entry, 10 are monoatomic - leaving 13 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$
5	SO4	A	508	-	4,4,4	0.64	0	6,6,6	0.23	0
2	SFG	A	501	-	24,29,29	0.88	1 (4%)	20,42,42	1.10	2 (10%)
6	EDO	B	510	-	3,3,3	0.26	0	2,2,2	0.11	0
6	EDO	B	512	-	3,3,3	0.24	0	2,2,2	0.45	0
6	EDO	A	511	-	3,3,3	0.25	0	2,2,2	0.31	0
5	SO4	B	509	-	4,4,4	0.66	0	6,6,6	0.16	0
2	SFG	B	501	-	24,29,29	0.87	2 (8%)	20,42,42	0.96	2 (10%)
5	SO4	B	508	-	4,4,4	0.69	0	6,6,6	0.09	0
5	SO4	A	510	-	4,4,4	0.75	0	6,6,6	0.17	0
6	EDO	B	511	-	3,3,3	0.24	0	2,2,2	0.36	0
3	GTP	B	502	-	29,34,34	1.56	5 (17%)	35,54,54	1.27	4 (11%)
3	GTP	A	502	-	29,34,34	1.82	5 (17%)	35,54,54	1.53	8 (22%)
5	SO4	A	509	-	4,4,4	0.68	0	6,6,6	0.16	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
2	SFG	A	501	-	-	2/13/33/33	0/3/3/3

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
6	EDO	B	510	-	-	1/1/1/1	-
6	EDO	B	512	-	-	0/1/1/1	-
6	EDO	A	511	-	-	0/1/1/1	-
2	SFG	B	501	-	-	2/13/33/33	0/3/3/3
6	EDO	B	511	-	-	0/1/1/1	-
3	GTP	B	502	-	-	2/18/38/38	0/3/3/3
3	GTP	A	502	-	-	3/18/38/38	0/3/3/3

All (13) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	502	GTP	PB-O3A	5.67	1.65	1.59
3	B	502	GTP	PA-O3A	4.12	1.63	1.59
3	B	502	GTP	C5-C6	-4.06	1.39	1.47
3	A	502	GTP	PA-O3A	3.99	1.63	1.59
3	A	502	GTP	C5-C6	-3.69	1.40	1.47
3	B	502	GTP	PB-O3A	3.49	1.63	1.59
3	A	502	GTP	PB-O3B	3.23	1.63	1.59
3	A	502	GTP	O4'-C1'	2.81	1.44	1.40
3	B	502	GTP	O4'-C1'	2.54	1.44	1.40
3	B	502	GTP	PB-O3B	2.23	1.61	1.59
2	A	501	SFG	C1'-N9	-2.14	1.44	1.49
2	B	501	SFG	O4'-C1'	2.13	1.43	1.40
2	B	501	SFG	C1'-N9	-2.09	1.44	1.49

All (16) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	502	GTP	C8-N7-C5	3.89	109.17	102.55
3	A	502	GTP	O2A-PA-O3A	3.41	116.49	107.27
2	A	501	SFG	C4'-O4'-C1'	-3.07	107.11	109.92
2	B	501	SFG	C4'-O4'-C1'	-2.99	107.19	109.92
3	B	502	GTP	C8-N7-C5	2.84	107.39	102.55
3	B	502	GTP	O2G-PG-O3B	2.49	113.00	104.64
2	A	501	SFG	C5-C6-N6	2.48	124.09	120.31
3	B	502	GTP	C4'-O4'-C1'	2.43	112.15	109.92
3	A	502	GTP	O4'-C1'-N9	-2.42	105.54	108.75
3	A	502	GTP	O6-C6-N1	-2.36	117.82	120.62
3	A	502	GTP	C2-N1-C6	-2.31	120.89	125.11
2	B	501	SFG	C5-C6-N6	2.24	123.72	120.31
3	A	502	GTP	C4'-O4'-C1'	2.19	111.93	109.92

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	502	GTP	O2G-PG-O3B	2.19	111.98	104.64
3	B	502	GTP	O6-C6-N1	-2.13	118.10	120.62
3	A	502	GTP	C5-C6-N1	2.03	117.95	114.07

There are no chirality outliers.

All (10) torsion outliers are listed below:

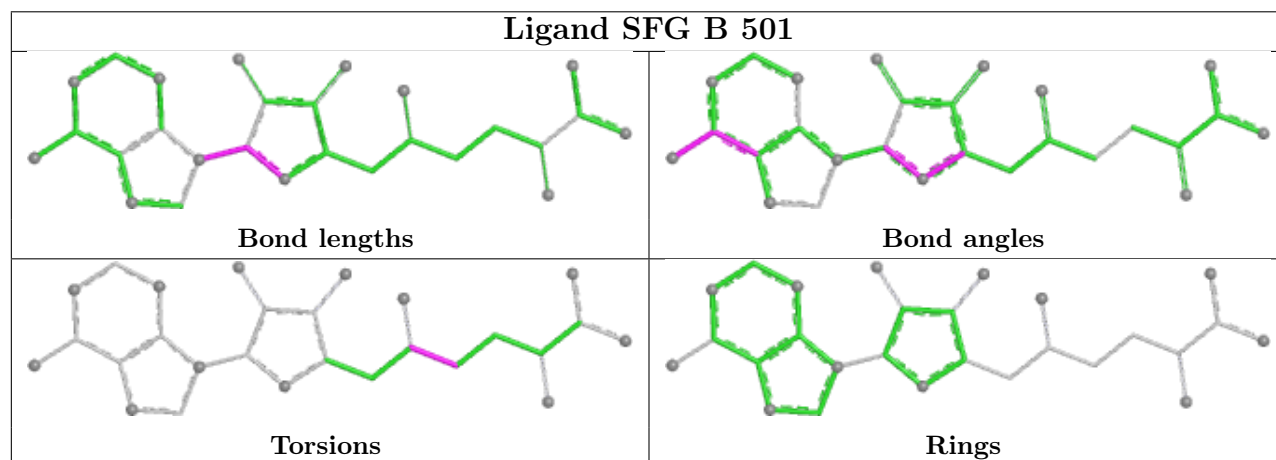
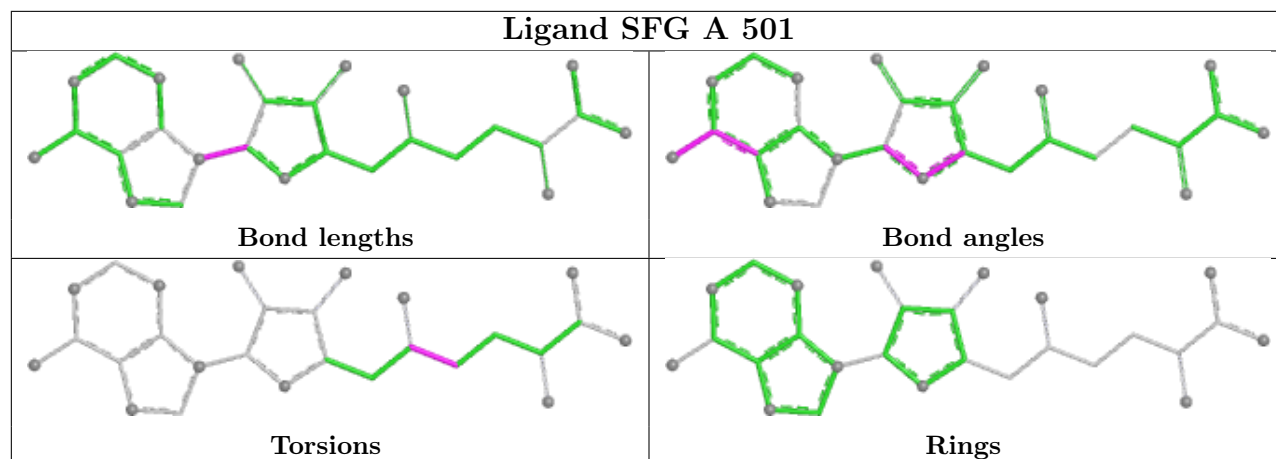
Mol	Chain	Res	Type	Atoms
3	A	502	GTP	PB-O3A-PA-O1A
2	A	501	SFG	NE-CD-CG-CB
2	A	501	SFG	C5'-CD-CG-CB
2	B	501	SFG	NE-CD-CG-CB
2	B	501	SFG	C5'-CD-CG-CB
3	B	502	GTP	PB-O3A-PA-O1A
6	B	510	EDO	O1-C1-C2-O2
3	A	502	GTP	PB-O3A-PA-O2A
3	B	502	GTP	PB-O3A-PA-O2A
3	A	502	GTP	PG-O3B-PB-O2B

There are no ring outliers.

4 monomers are involved in 4 short contacts:

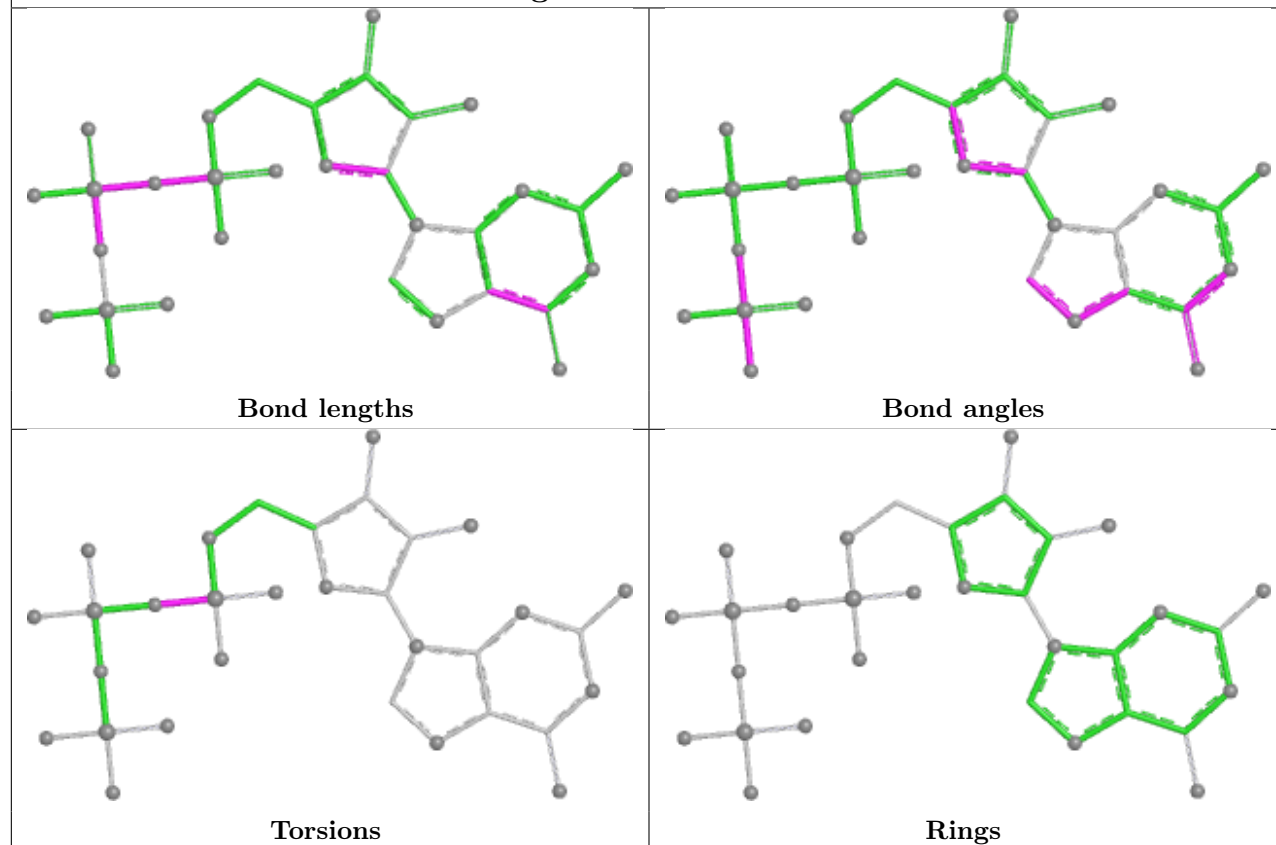
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	501	SFG	1	0
6	B	512	EDO	1	0
2	B	501	SFG	1	0
5	A	510	SO4	1	0

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.

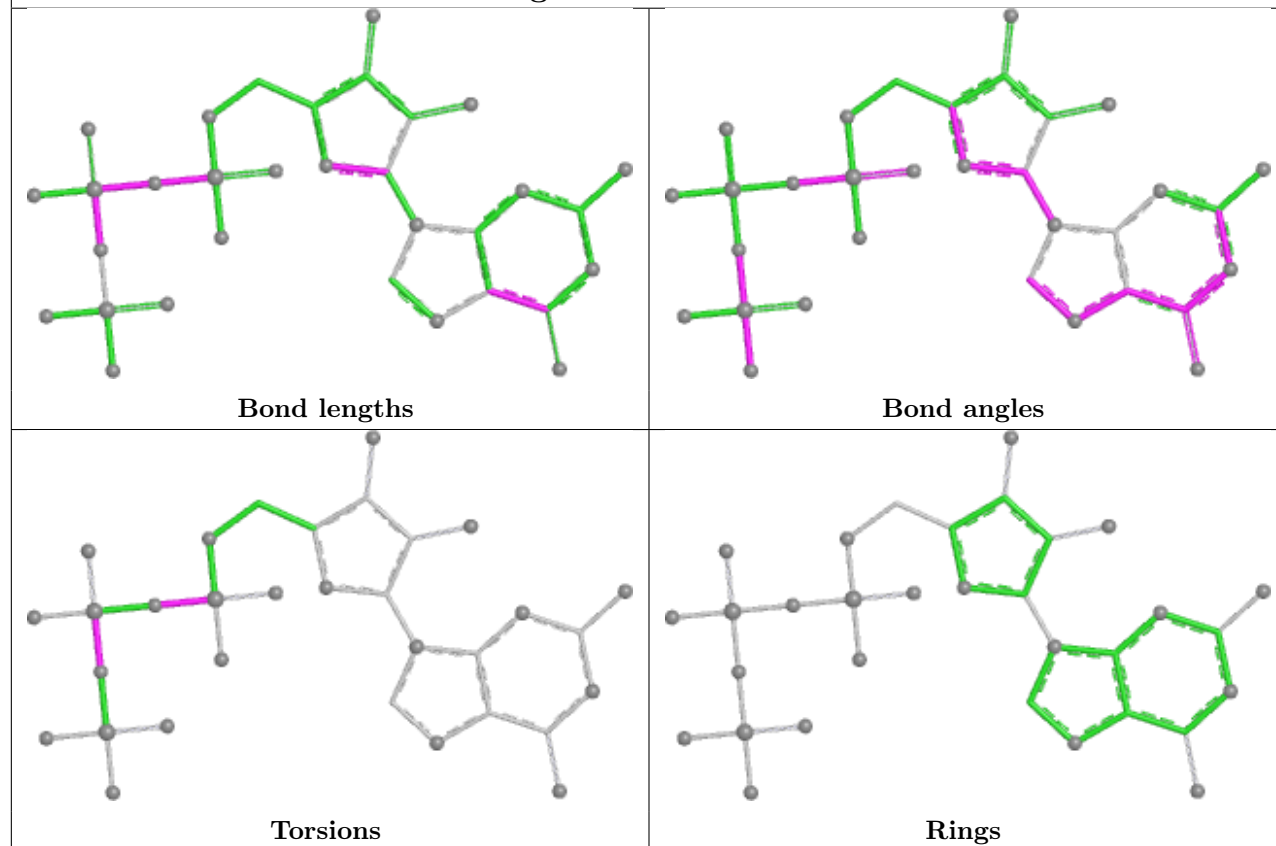




## Ligand GTP B 502



## Ligand GTP A 502



## 5.7 Other polymers

There are no such residues in this entry.

## 5.8 Polymer linkage issues

There are no chain breaks in this entry.

## 6 Fit of model and data ⓘ

### 6.1 Protein, DNA and RNA chains ⓘ

In the following table, the column labelled ‘#RSRZ > 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95<sup>th</sup> 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 <sup>2</sup> )	Q < 0.9
1	A	288/289 (99%)	0.20	26 (9%)	17 15	9, 22, 51, 76	9 (3%)
1	B	289/289 (100%)	-0.05	13 (4%)	39 39	8, 20, 45, 75	8 (2%)
All	All	577/578 (99%)	0.07	39 (6%)	25 24	8, 21, 49, 76	17 (2%)

All (39) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	209	ASN	6.0
1	A	233	PHE	5.7
1	A	381	VAL	5.5
1	A	380	TRP	4.8
1	B	233	PHE	4.1
1	A	382	ASN	3.8
1	A	383	ARG	3.6
1	B	208	LYS	3.4
1	A	236	CYS	3.4
1	B	210	LEU	3.4
1	A	425	GLN	3.4
1	A	384	PHE	3.4
1	A	229	ALA	3.2
1	A	138	SER	3.2
1	B	236	CYS	2.9
1	A	397	GLY	2.8
1	A	208	LYS	2.8
1	B	234	PRO	2.8
1	A	387	LYS	2.7
1	B	379	ASN	2.7
1	A	398	ARG	2.6
1	A	228	VAL	2.6
1	A	232	SER	2.5
1	A	235	GLU	2.4

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Mol	Chain	Res	Type	RSRZ
1	B	229	ALA	2.4
1	A	238	PHE	2.4
1	B	232	SER	2.3
1	B	230	VAL	2.3
1	A	388	MET	2.3
1	A	403	GLY	2.3
1	A	385	SER	2.2
1	A	209	ASN	2.2
1	A	386	PRO	2.2
1	A	379	ASN	2.2
1	A	399	TYR	2.2
1	B	424	TYR	2.1
1	B	398	ARG	2.1
1	B	228	VAL	2.1
1	A	237	ARG	2.1

## 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 oligosaccharides 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, 95<sup>th</sup> 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.

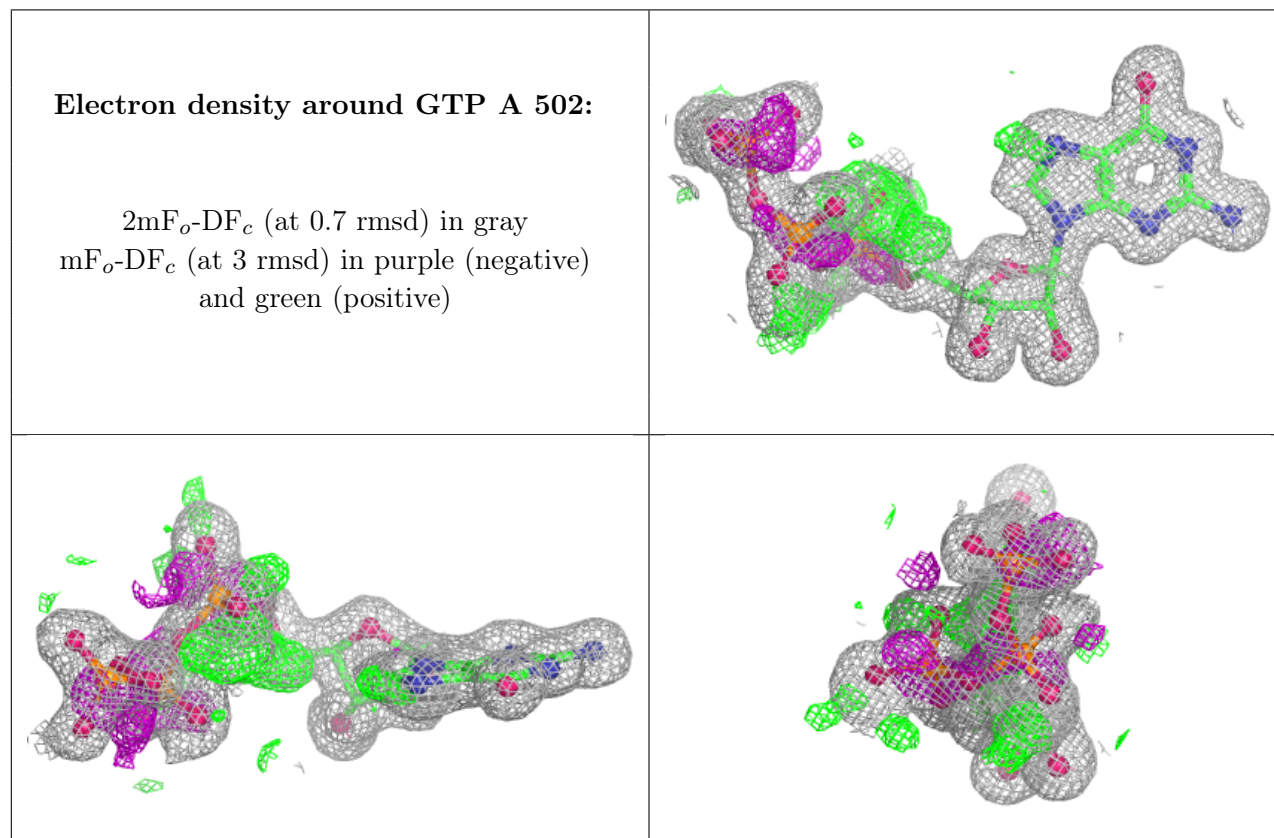
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å <sup>2</sup> )	Q<0.9
5	SO4	B	508	5/5	0.77	0.10	58,62,71,71	0
6	EDO	B	510	4/4	0.85	0.13	23,30,36,40	0
6	EDO	B	512	4/4	0.85	0.14	24,36,43,43	0
6	EDO	B	511	4/4	0.87	0.11	28,33,36,43	0
6	EDO	A	511	4/4	0.90	0.10	24,28,33,36	0
3	GTP	A	502	32/32	0.93	0.09	11,16,32,33	0
5	SO4	A	509	5/5	0.94	0.09	27,28,36,37	0
3	GTP	B	502	32/32	0.94	0.08	10,14,24,27	0

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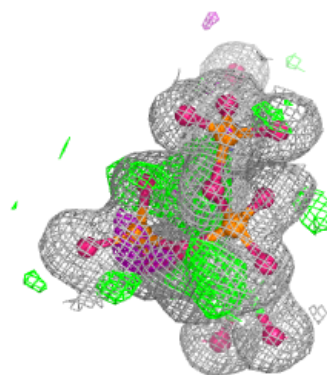
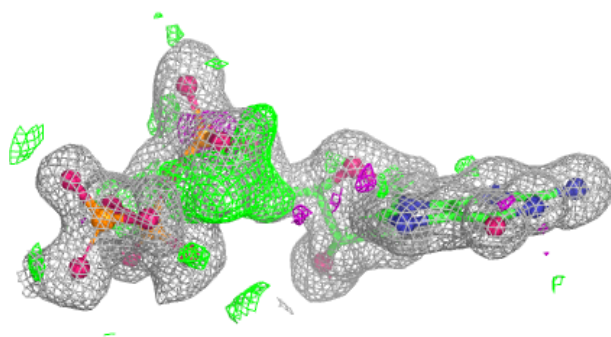
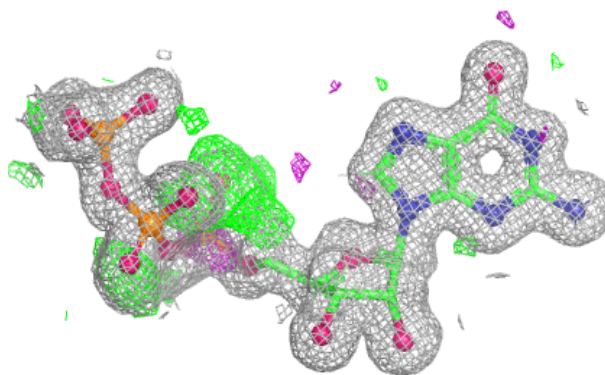
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
5	SO4	A	510	5/5	0.95	0.08	30,38,43,48	0
5	SO4	A	508	5/5	0.96	0.07	25,27,31,33	0
5	SO4	B	509	5/5	0.96	0.08	28,30,35,38	0
2	SFG	A	501	27/27	0.97	0.05	11,14,18,19	0
4	NA	A	507	1/1	0.98	0.09	23,23,23,23	0
4	NA	B	504	1/1	0.98	0.07	23,23,23,23	0
4	NA	B	506	1/1	0.98	0.09	19,19,19,19	0
2	SFG	B	501	27/27	0.98	0.05	10,13,16,17	0
4	NA	A	503	1/1	0.98	0.05	22,22,22,22	0
4	NA	A	504	1/1	0.98	0.05	21,21,21,21	0
4	NA	B	505	1/1	0.99	0.05	20,20,20,20	0
4	NA	B	503	1/1	0.99	0.03	18,18,18,18	0
4	NA	B	507	1/1	0.99	0.03	22,22,22,22	0
4	NA	A	506	1/1	0.99	0.06	24,24,24,24	0
4	NA	A	505	1/1	1.00	0.03	17,17,17,17	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.

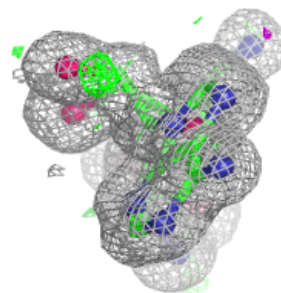
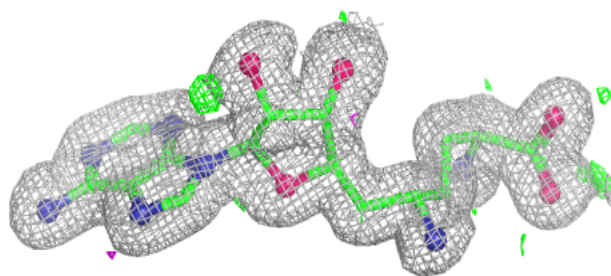
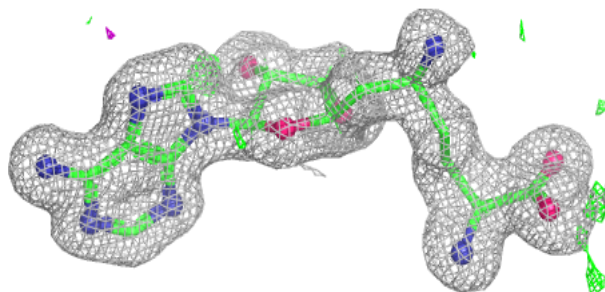


**Electron density around GTP B 502:**

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

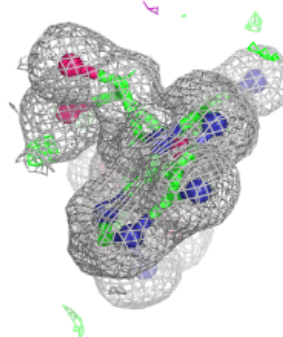
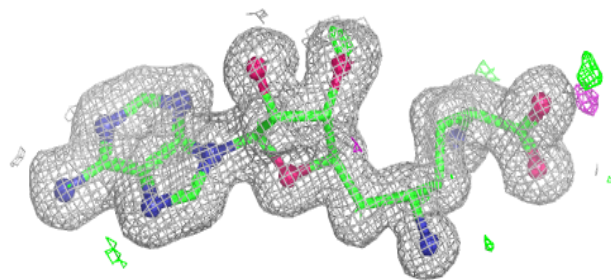
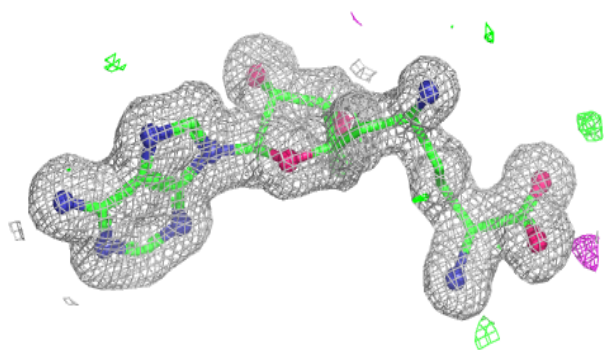
**Electron density around SFG A 501:**

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



**Electron density around SFG 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)



## 6.5 Other polymers [i](#)

There are no such residues in this entry.