



# wwPDB X-ray Structure Validation Summary Report ⓘ

Feb 28, 2026 – 08:29 PM UTC

PDB ID : 5MF4 / pdb\_00005mf4  
Title : Tubulin-Dictyostatin complex  
Authors : Trigili, C.; Barasoain, I.; Sanchez-Murcia, P.A.; Bargsten, K.; Redondo-Horcajo, M.; Nogales, A.; Gardner, N.M.; Meyer, A.; Naylor, G.J.; Gomez-Rubio, E.; Gago, F.; Steinmetz, M.O.; Paterson, I.; Protá, A.E.; Diaz, J.F.  
Deposited on : 2016-11-17  
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](mailto:validation@mail.wwpdb.org)

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<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 Phenix2.0  
Mogul : 2022.3.0, CSD as543be (2022)  
Xtrriage (Phenix) : 2.0  
EDS : 3.0  
Buster-report : wwPDB partial adaption of 1.1.7 (2018)  
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)  
CCP4 : 9.0.010 (Gargrove)  
Density-Fitness : 1.0.12  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.49

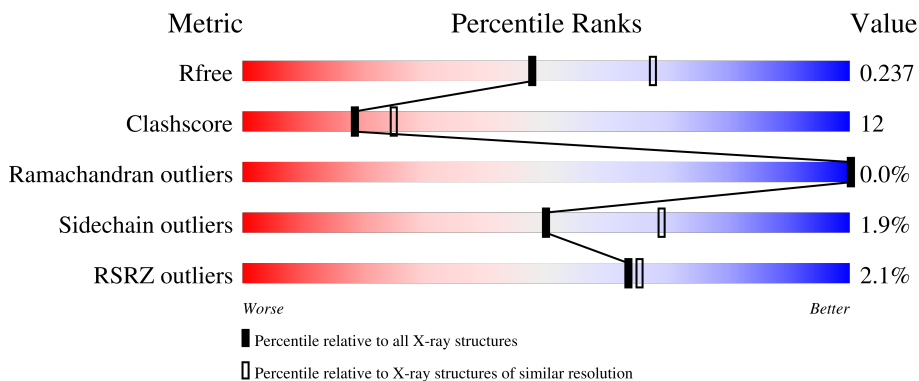
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.30 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.



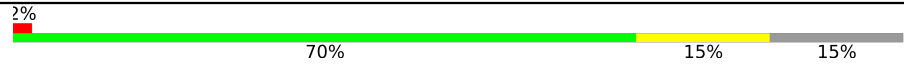

Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
$R_{free}$	180053	6319 (2.30-2.30)
Clashscore	190562	6919 (2.30-2.30)
Ramachandran outliers	187476	6854 (2.30-2.30)
Sidechain outliers	187428	6854 (2.30-2.30)
RSRZ outliers	180081	6325 (2.30-2.30)

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  $\geq 3$ , 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	451	
1	C	451	
2	B	445	
2	D	445	

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Mol	Chain	Length	Quality of chain
3	E	143	 <p>2% 70% 15% 15%</p>
4	F	384	 <p>4% 60% 24% 15%</p>

## 2 Entry composition [i](#)

There are 13 unique types of molecules in this entry. The entry contains 17747 atoms, of which 117 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
			Total	C	N	O	S			
1	A	435	Total	C	N	O	S	0	0	0
			3399	2150	579	649	21			
1	C	440	Total	C	N	O	S	0	0	0
			3437	2175	584	656	22			

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

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	427	Total	C	N	O	S	0	0	0
			3356	2106	574	650	26			
2	D	425	Total	C	N	O	S	0	1	0
			3338	2095	569	647	27			

- Molecule 3 is a protein called Stathmin-4.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
3	E	122	Total	C	N	O	S	0	0	0
			1009	622	182	200	5			

There are 2 discrepancies between the modelled and reference sequences:

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

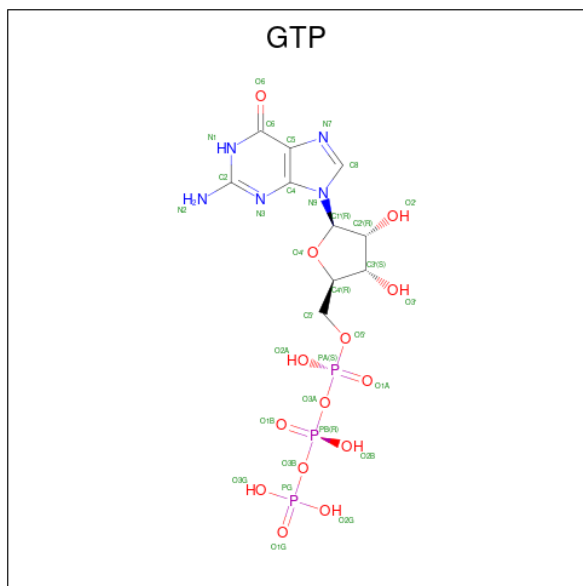
- Molecule 4 is a protein called Uncharacterized protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
4	F	326	Total	C	N	O	S	0	0	0
			2678	1725	458	481	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 (CCD ID: GTP) (formula: C<sub>10</sub>H<sub>16</sub>N<sub>5</sub>O<sub>14</sub>P<sub>3</sub>).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	
			Total	C	N	O			P
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		

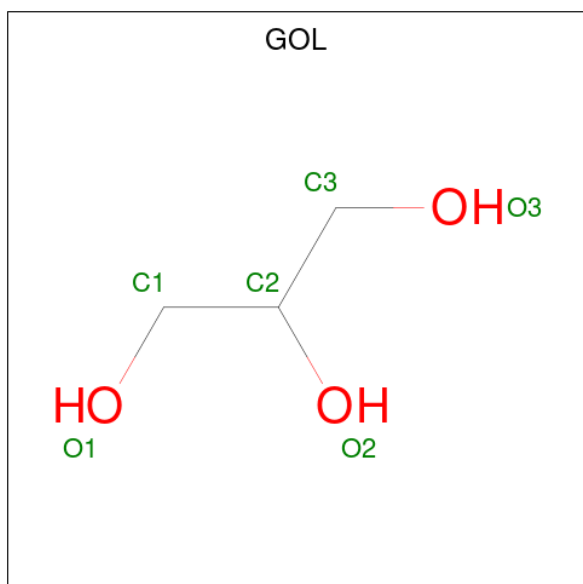
- Molecule 6 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

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		

- Molecule 7 is CALCIUM ION (CCD ID: CA) (formula: Ca).

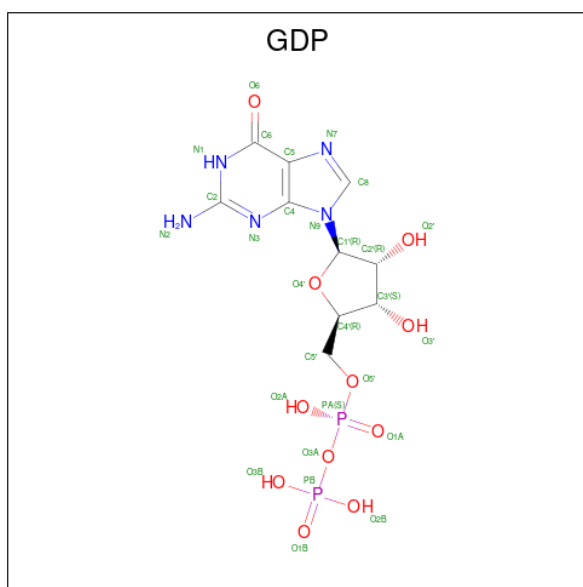
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
7	A	1	Total Ca 1 1	0	0
7	C	1	Total Ca 1 1	0	0
7	F	1	Total Ca 1 1	0	0

- Molecule 8 is GLYCEROL (CCD ID: GOL) (formula: C<sub>3</sub>H<sub>8</sub>O<sub>3</sub>).



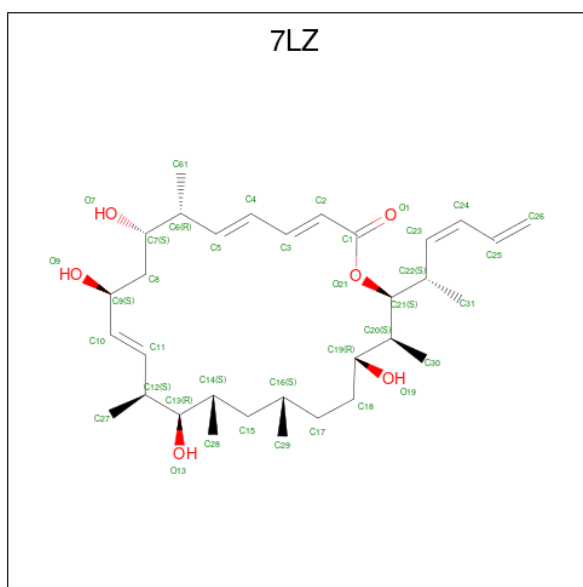
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
8	A	1	Total C O 6 3 3	0	0
8	A	1	Total C O 6 3 3	0	0

- Molecule 9 is GUANOSINE-5'-DIPHOSPHATE (CCD ID: GDP) (formula: C<sub>10</sub>H<sub>15</sub>N<sub>5</sub>O<sub>11</sub>P<sub>2</sub>).



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

- Molecule 10 is (3 {Z},5 {E},7 {R},8 {S},10 {S},11 {Z},13 {S},14 {R},15 {S},17 {S},20 {R},21 {S},22 {S})-22-[(2 {S},3 {Z})-hexa-3,5-dien-2-yl]-7,13,15,17,21-pentamethyl-8,10,14,20-tetrakis(oxidanyl)-1-oxacyclodocosa-3,5,11-trien-2-one (CCD ID: 7LZ) (formula: C<sub>32</sub>H<sub>52</sub>O<sub>6</sub>).



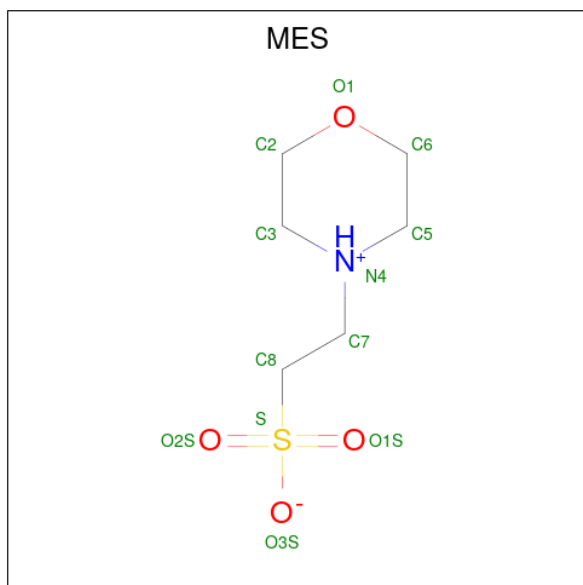
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	H	O		
10	B	1	Total	C	H	O	0	0
			90	32	52	6		

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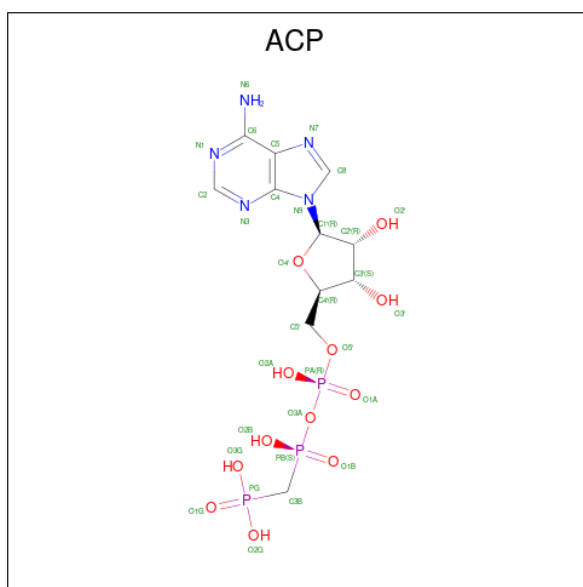
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	H	O		
10	D	1	90	32	52	6	0	0

- Molecule 11 is 2-(N-MORPHOLINO)-ETHANESULFONIC ACID (CCD ID: MES) (formula: C<sub>6</sub>H<sub>13</sub>NO<sub>4</sub>S).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	S		
11	B	1	12	6	1	4	1	0	0
11	D	1	25	6	13	1	4	1	0

- Molecule 12 is PHOSPHOMETHYLPHOSPHONIC ACID ADENYLATE ESTER (CCD ID: ACP) (formula: C<sub>11</sub>H<sub>18</sub>N<sub>5</sub>O<sub>12</sub>P<sub>3</sub>).

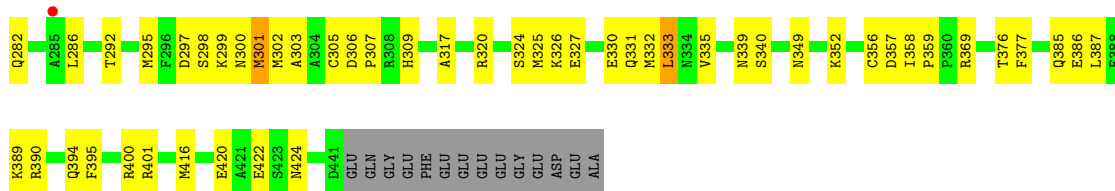


Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	P		
12	F	1	31	11	5	12	3	0	0

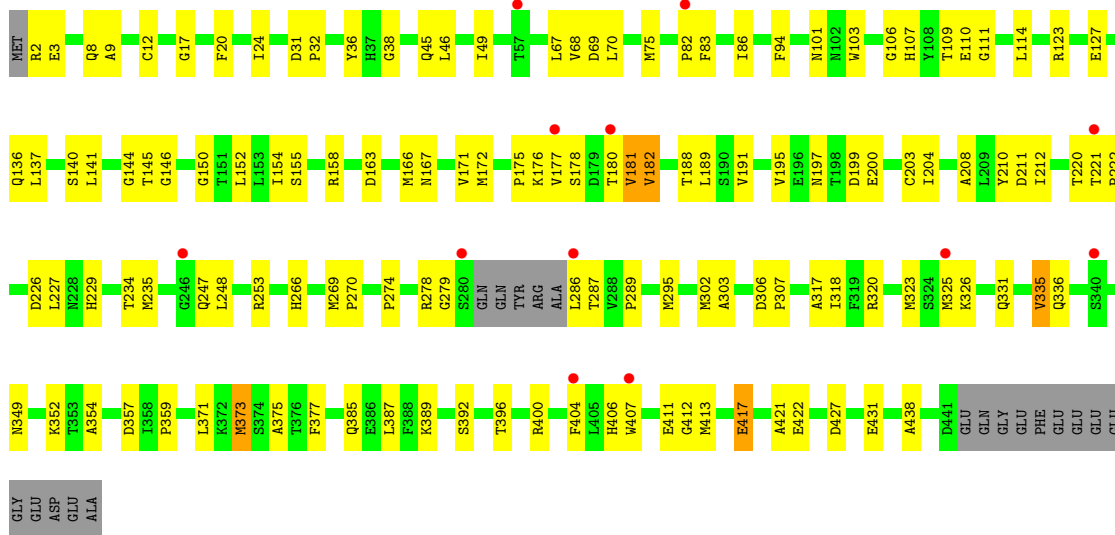
- Molecule 13 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
13	A	31	Total	O	0	0
			31	31		
13	B	27	Total	O	0	0
			27	27		
13	C	57	Total	O	0	0
			57	57		
13	D	12	Total	O	0	0
			12	12		
13	E	9	Total	O	0	0
			9	9		
13	F	7	Total	O	0	0
			7	7		

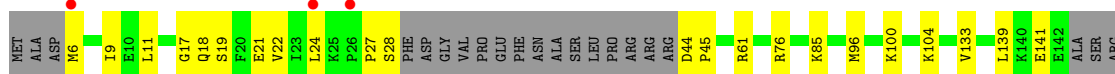




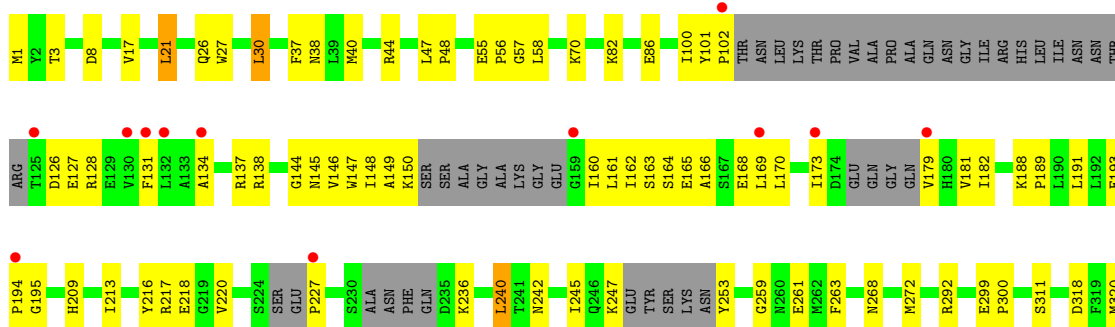
● Molecule 2: Tubulin beta-2B chain

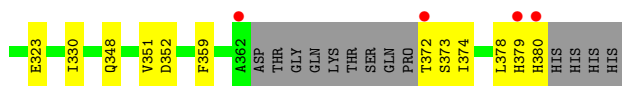


● Molecule 3: Stathmin-4



● Molecule 4: Uncharacterized protein





## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	104.01Å 156.51Å 179.06Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	67.85 – 2.30 67.85 – 2.30	Depositor EDS
% Data completeness (in resolution range)	99.8 (67.85-2.30) 99.8 (67.85-2.30)	Depositor EDS
$R_{merge}$	0.11	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.01 (at 2.29Å)	Xtrriage
Refinement program	PHENIX (1.10.1_2155: ???)	Depositor
R, $R_{free}$	0.183 , 0.233 0.192 , 0.237	Depositor DCC
$R_{free}$ test set	6488 reflections (4.65%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	60.0	Xtrriage
Anisotropy	0.174	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.34 , 56.0	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.50$ , $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.97	EDS
Total number of atoms	17747	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	82.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.52% of the height of the origin peak. No significant pseudotranslation is detected.*

<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 [i](#)

### 5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: ACP, CA, MG, GOL, MES, GTP, GDP, 7LZ

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	0.36	0/3475	0.54	0/4716
1	C	0.42	0/3515	0.58	0/4772
2	B	0.37	0/3430	0.54	0/4645
2	D	0.31	0/3414	0.51	0/4624
3	E	0.34	0/1017	0.48	0/1349
4	F	0.27	0/2736	0.47	0/3690
All	All	0.35	0/17587	0.53	0/23796

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	3399	0	3308	78	0
1	C	3437	0	3349	65	1
2	B	3356	0	3228	105	1
2	D	3338	0	3215	94	0
3	E	1009	0	1024	25	0
4	F	2678	0	2664	68	0
5	A	32	0	12	1	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
7	A	1	0	0	0	0
7	C	1	0	0	0	0
7	F	1	0	0	0	0
8	A	12	0	14	1	0
9	B	28	0	12	1	0
9	D	28	0	12	1	0
10	B	38	52	0	2	0
10	D	38	52	0	0	0
11	B	12	0	13	3	0
11	D	12	13	13	1	0
12	F	31	0	14	2	0
13	A	31	0	0	1	0
13	B	27	0	0	1	0
13	C	57	0	0	3	0
13	D	12	0	0	0	0
13	E	9	0	0	2	0
13	F	7	0	0	0	0
All	All	17630	117	16890	411	1

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 12.

The worst 5 of 411 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:381:THR:HG22	1:C:383:ALA:H	1.24	1.01
2:B:2:ARG:HD3	2:B:50:ASN:ND2	1.79	0.97
1:A:221:ARG:HG2	2:B:325:MET:HG2	1.47	0.95
4:F:240:LEU:HD23	4:F:245:ILE:HD13	1.49	0.93
1:C:71:GLU:HG2	1:C:72:PRO:HD2	1.53	0.88

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:113:GLU:OE1	1:C:283:HIS:NE2[4_555]	2.15	0.05

### 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	431/451 (96%)	421 (98%)	10 (2%)	0	100	100
1	C	438/451 (97%)	427 (98%)	11 (2%)	0	100	100
2	B	423/445 (95%)	410 (97%)	12 (3%)	1 (0%)	43	55
2	D	422/445 (95%)	405 (96%)	17 (4%)	0	100	100
3	E	118/143 (82%)	115 (98%)	3 (2%)	0	100	100
4	F	310/384 (81%)	296 (96%)	14 (4%)	0	100	100
All	All	2142/2319 (92%)	2074 (97%)	67 (3%)	1 (0%)	100	100

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	B	82	PRO

#### 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	367/379 (97%)	362 (99%)	5 (1%)	59	76
1	C	371/379 (98%)	366 (99%)	5 (1%)	61	77

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
2	B	368/383 (96%)	362 (98%)	6 (2%)	55	73
2	D	368/383 (96%)	356 (97%)	12 (3%)	33	50
3	E	110/127 (87%)	110 (100%)	0	100	100
4	F	294/342 (86%)	287 (98%)	7 (2%)	43	62
All	All	1878/1993 (94%)	1843 (98%)	35 (2%)	50	69

5 of 35 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
4	F	21	LEU
4	F	30	LEU
4	F	165	GLU
1	C	114	ILE
1	C	38	SER

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 24 such sidechains are listed below:

Mol	Chain	Res	Type
1	C	380	ASN
2	D	50	ASN
1	C	406	HIS
2	D	167	ASN
2	B	107	HIS

### 5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

## 5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

## 5.6 Ligand geometry [i](#)

Of 18 ligands modelled in this entry, 7 are monoatomic - leaving 11 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	29,30,30	1.30	4 (13%)	45,47,47	1.77	7 (15%)
5	GTP	C	501	6	33,34,34	1.05	2 (6%)	50,54,54	1.61	11 (22%)
12	ACP	F	402	7	31,33,33	2.29	11 (35%)	47,52,52	1.81	8 (17%)
5	GTP	A	501	6	33,34,34	1.13	2 (6%)	50,54,54	1.55	10 (20%)
8	GOL	A	504	11	5,5,5	0.45	0	5,5,5	0.93	0
8	GOL	A	505	-	5,5,5	0.31	0	5,5,5	0.55	0
10	7LZ	D	503	-	37,38,38	2.33	14 (37%)	44,50,50	1.68	9 (20%)
11	MES	B	504	8	12,12,12	2.45	2 (16%)	15,16,16	1.48	2 (13%)
11	MES	D	504	-	12,12,12	2.40	1 (8%)	15,16,16	1.18	1 (6%)
10	7LZ	B	503	-	37,38,38	2.30	13 (35%)	44,50,50	1.82	12 (27%)
9	GDP	B	501	6	29,30,30	1.42	3 (10%)	45,47,47	1.82	9 (20%)

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. '2' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
9	GDP	D	501	6	-	4/16/32/32	0/3/3/3
5	GTP	C	501	6	-	6/22/38/38	0/3/3/3
12	ACP	F	402	7	-	7/19/38/38	0/3/3/3
5	GTP	A	501	6	-	7/22/38/38	0/3/3/3
8	GOL	A	504	11	-	2/4/4/4	-
8	GOL	A	505	-	-	2/4/4/4	-
10	7LZ	D	503	-	-	7/57/57/57	0/0/1/1
11	MES	B	504	8	-	5/6/14/14	0/1/1/1
11	MES	D	504	-	-	0/6/14/14	0/1/1/1

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
10	7LZ	B	503	-	-	5/57/57/57	0/0/1/1
9	GDP	B	501	6	-	5/16/32/32	0/3/3/3

The worst 5 of 52 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
11	D	504	MES	C8-S	-8.04	1.66	1.77
11	B	504	MES	C8-S	-7.97	1.66	1.77
10	D	503	7LZ	C3-C2	5.76	1.49	1.34
12	F	402	ACP	PG-O1G	5.73	1.61	1.50
10	B	503	7LZ	C3-C2	5.62	1.49	1.34

The worst 5 of 69 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
12	F	402	ACP	C5-C4-N3	-6.25	118.11	126.72
9	D	501	GDP	C5-C4-N3	-6.08	118.72	128.39
9	B	501	GDP	C5-C4-N3	-5.44	119.74	128.39
12	F	402	ACP	N3-C4-N9	4.99	135.65	127.17
10	B	503	7LZ	O21-C21-C22	4.95	115.30	107.12

There are no chirality outliers.

5 of 50 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	A	501	GTP	PB-O3B-PG-O2G
5	A	501	GTP	C5'-O5'-PA-O3A
5	A	501	GTP	C5'-O5'-PA-O1A
5	A	501	GTP	C5'-O5'-PA-O2A
5	C	501	GTP	C5'-O5'-PA-O3A

There are no ring outliers.

8 monomers are involved in 12 short contacts:

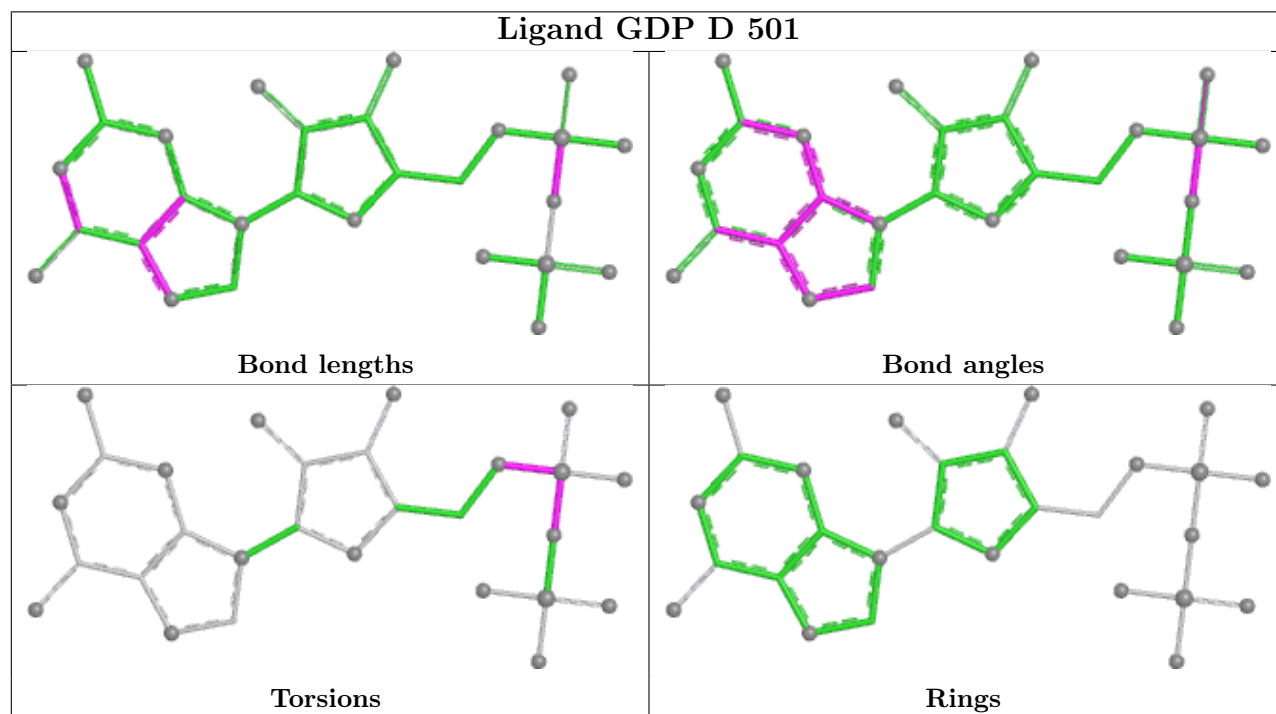
Mol	Chain	Res	Type	Clashes	Symm-Clashes
9	D	501	GDP	1	0
12	F	402	ACP	2	0
5	A	501	GTP	1	0
8	A	504	GOL	1	0
11	B	504	MES	3	0

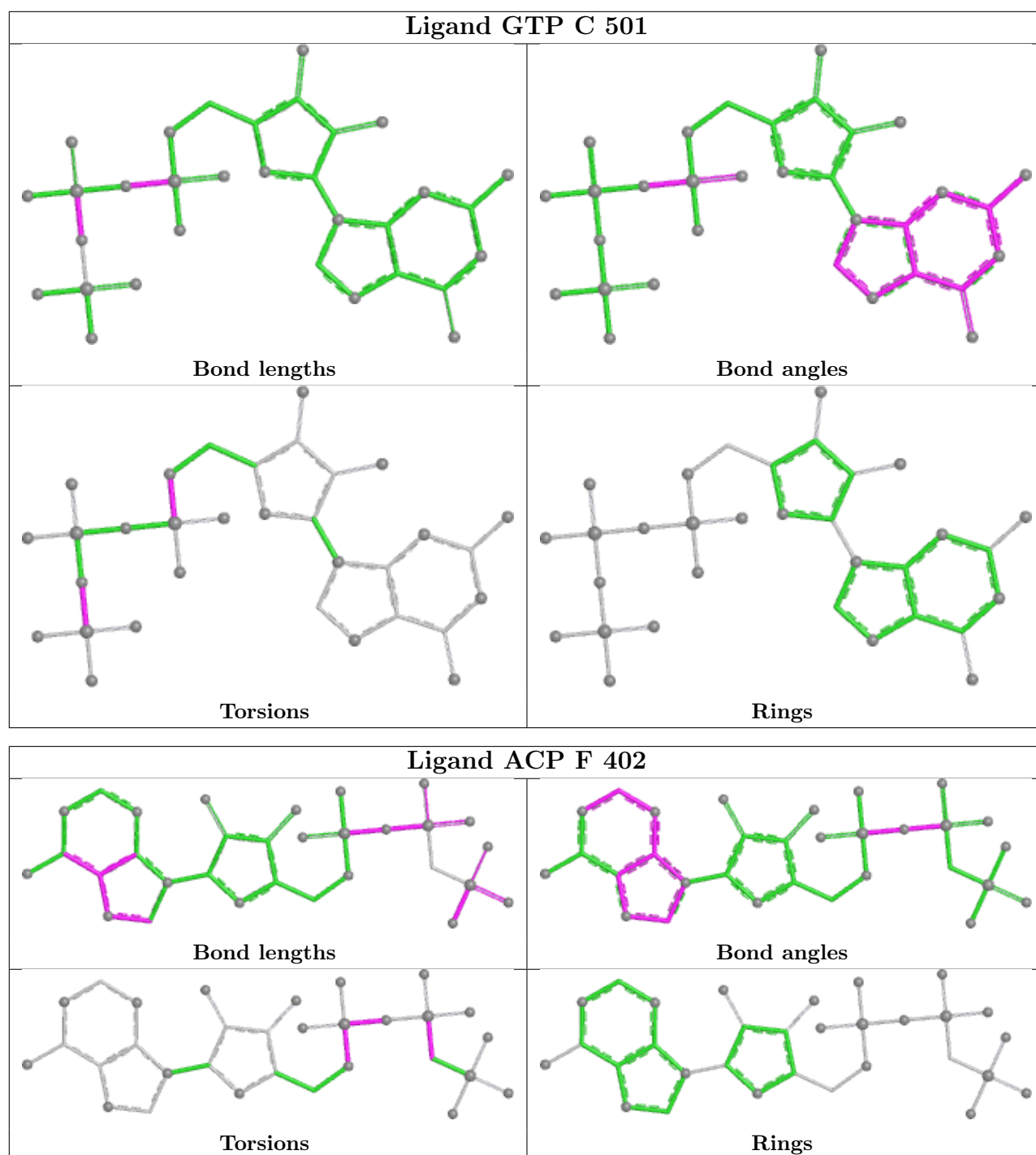
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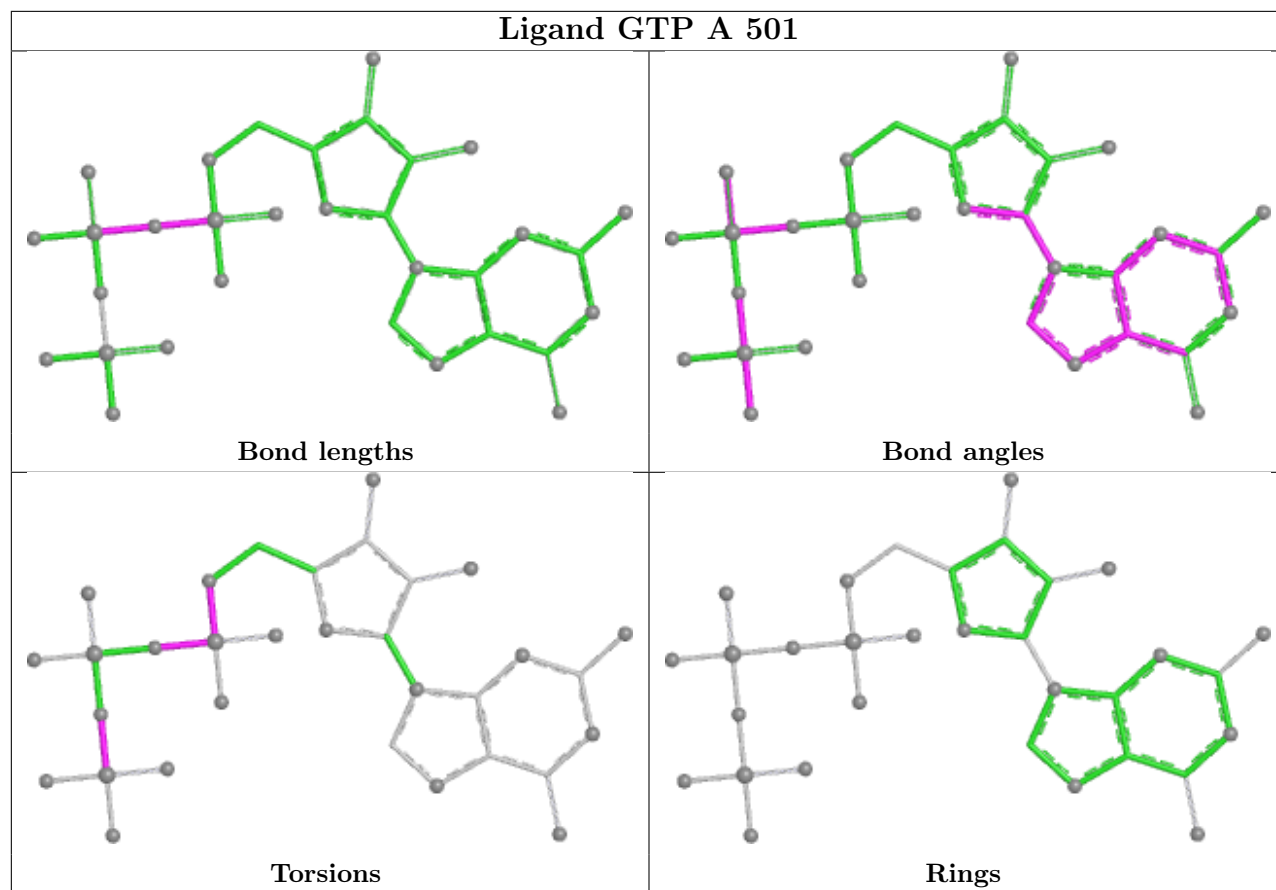
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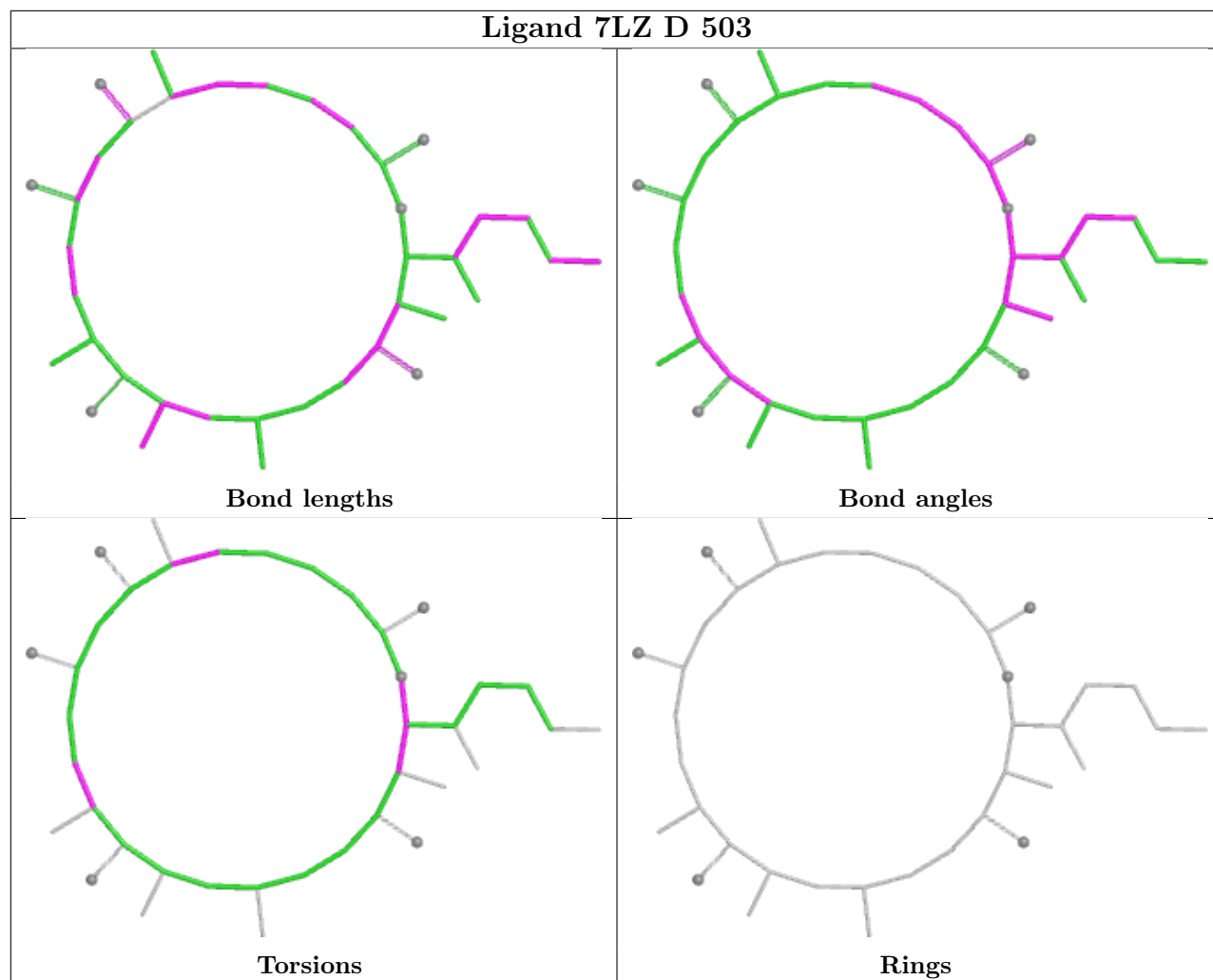
Mol	Chain	Res	Type	Clashes	Symm-Clashes
11	D	504	MES	1	0
10	B	503	7LZ	2	0
9	B	501	GDP	1	0

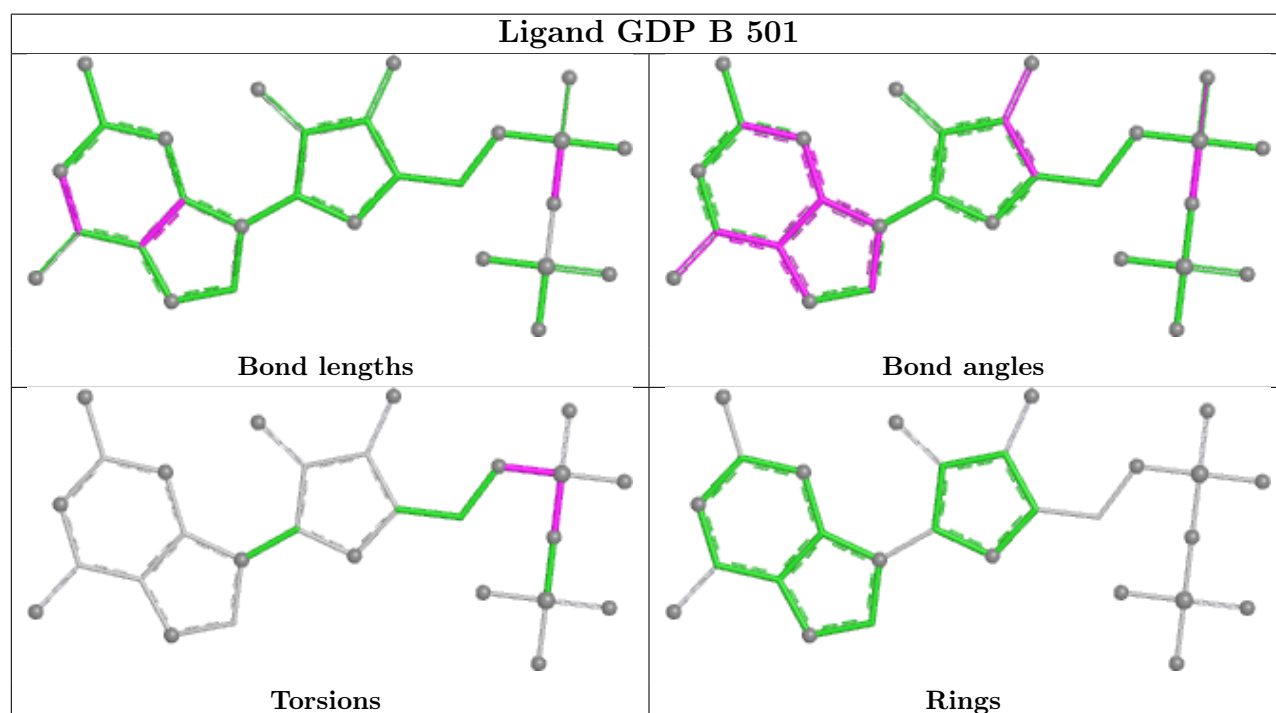
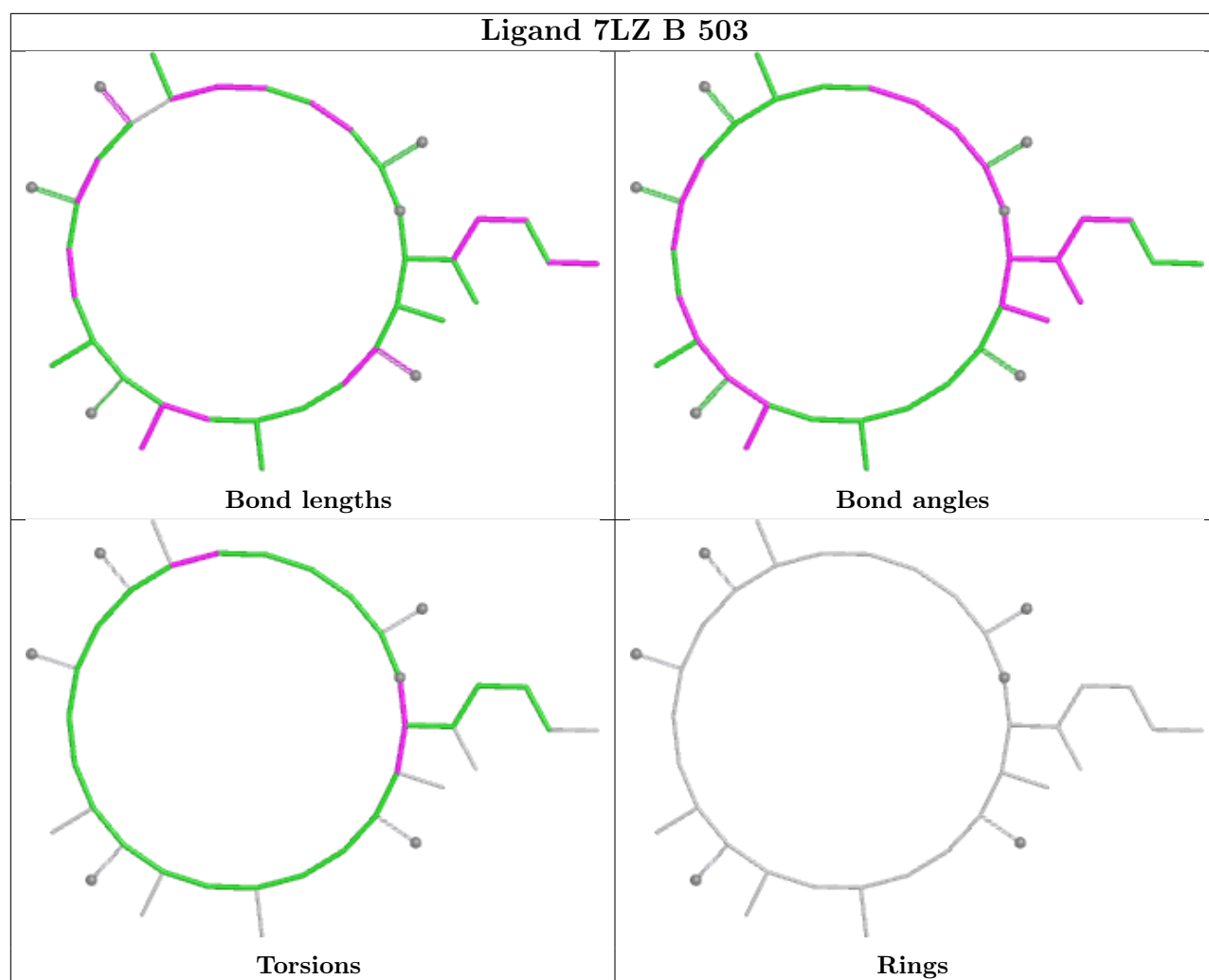
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. 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, 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	435/451 (96%)	-0.02	3 (0%) 84 85	47, 71, 108, 143	0
1	C	440/451 (97%)	-0.05	7 (1%) 70 72	46, 62, 98, 137	0
2	B	427/445 (95%)	0.12	4 (0%) 81 82	46, 70, 113, 163	2 (0%)
2	D	425/445 (95%)	0.28	12 (2%) 55 57	47, 85, 124, 140	4 (0%)
3	E	122/143 (85%)	0.22	3 (2%) 58 60	54, 83, 127, 151	0
4	F	326/384 (84%)	0.50	16 (4%) 35 36	57, 102, 160, 183	0
All	All	2175/2319 (93%)	0.15	45 (2%) 63 65	46, 76, 129, 183	6 (0%)

The worst 5 of 45 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	B	246	GLY	5.8
1	C	440	VAL	5.2
4	F	125	THR	4.2
2	D	280	SER	3.9
2	D	286	LEU	3.9

### 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](#)

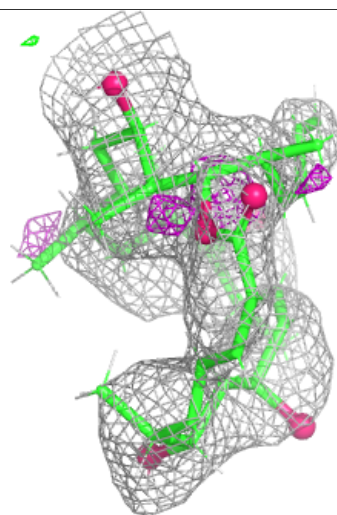
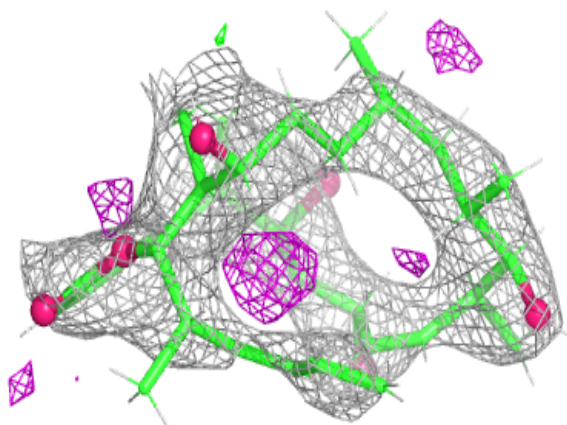
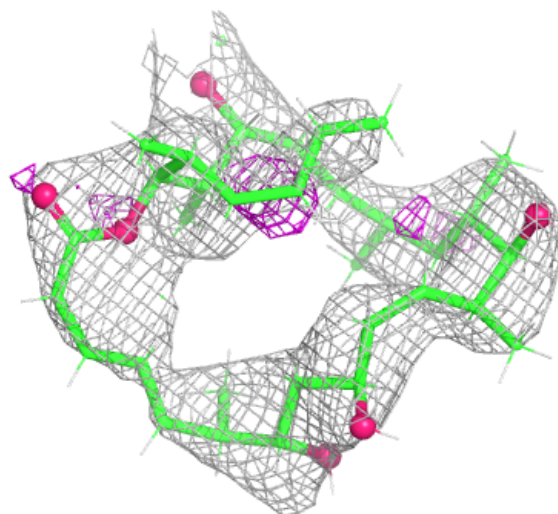
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95<sup>th</sup> percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 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
11	MES	D	504	12/12	0.81	0.16	116,132,148,149	0
8	GOL	A	504	6/6	0.85	0.12	85,92,103,103	0
8	GOL	A	505	6/6	0.89	0.19	97,101,106,112	0
10	7LZ	B	503	38/38	0.90	0.12	73,115,136,142	0
6	MG	A	502	1/1	0.90	0.15	61,61,61,61	0
12	ACP	F	402	31/31	0.91	0.08	96,123,162,166	0
7	CA	F	401	1/1	0.93	0.06	134,134,134,134	0
10	7LZ	D	503	38/38	0.93	0.11	83,108,129,135	0
11	MES	B	504	12/12	0.95	0.09	53,63,89,102	0
6	MG	B	502	1/1	0.95	0.12	55,55,55,55	0
9	GDP	D	501	28/28	0.95	0.09	64,75,87,100	0
6	MG	D	502	1/1	0.96	0.06	61,61,61,61	0
5	GTP	A	501	32/32	0.98	0.06	45,53,66,75	0
5	GTP	C	501	32/32	0.98	0.04	40,52,59,61	0
9	GDP	B	501	28/28	0.98	0.06	44,53,58,67	0
7	CA	A	503	1/1	0.99	0.03	99,99,99,99	0
7	CA	C	503	1/1	0.99	0.03	79,79,79,79	0
6	MG	C	502	1/1	0.99	0.03	55,55,55,55	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.

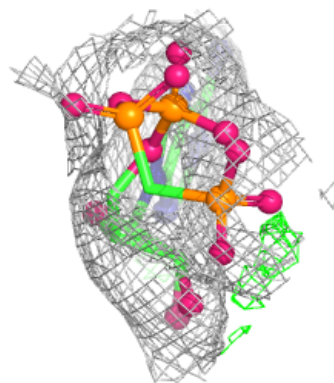
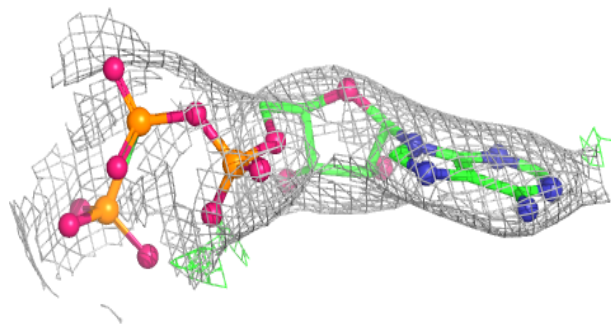
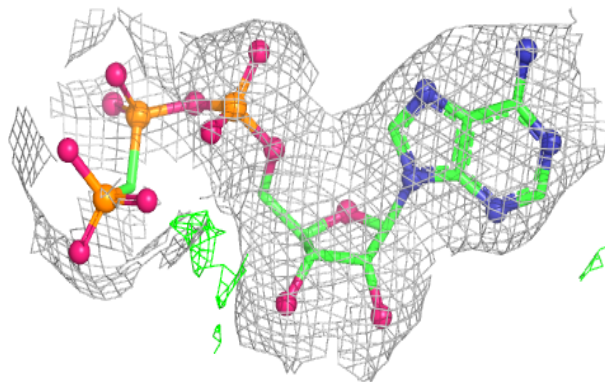
**Electron density around 7LZ B 503:**

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



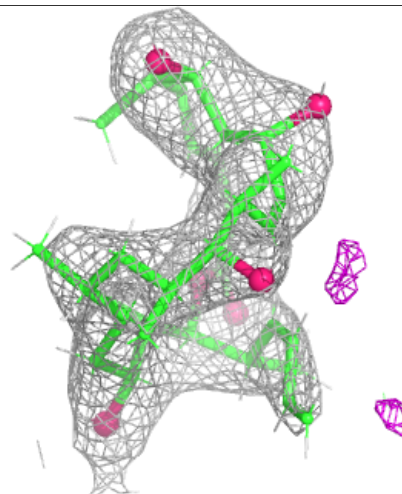
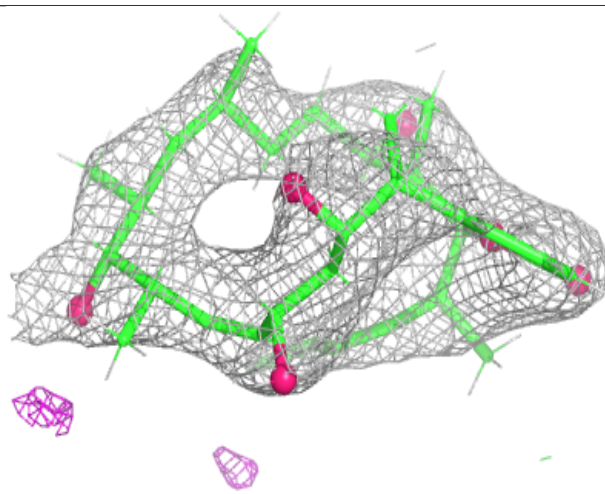
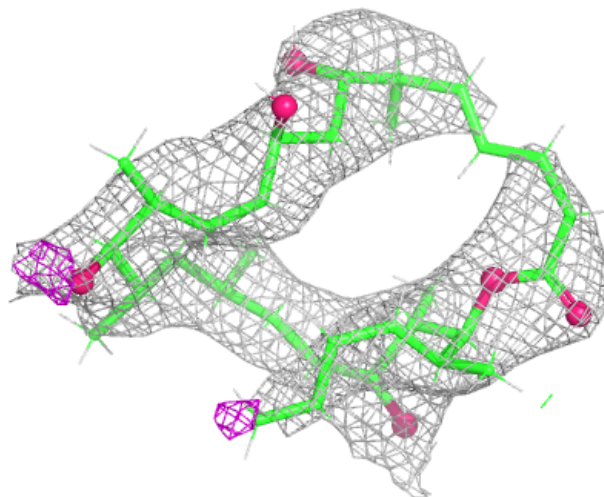
**Electron density around ACP F 402:**

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



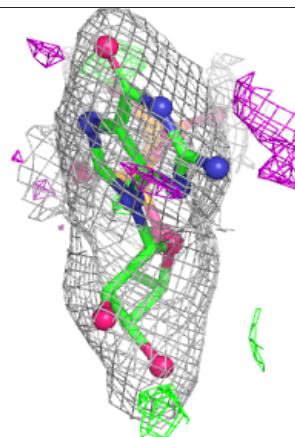
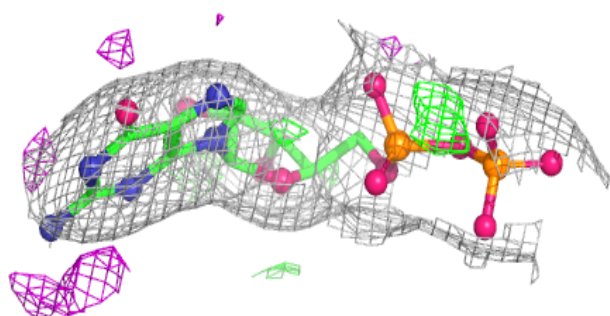
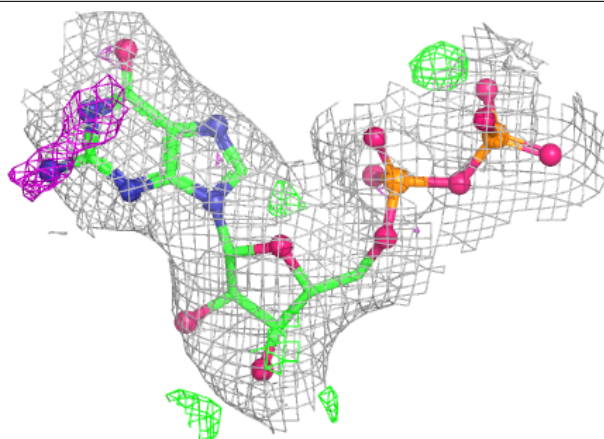
**Electron density around 7LZ D 503:**

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

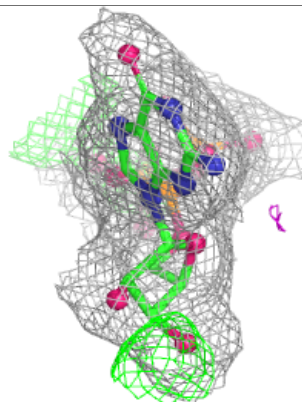
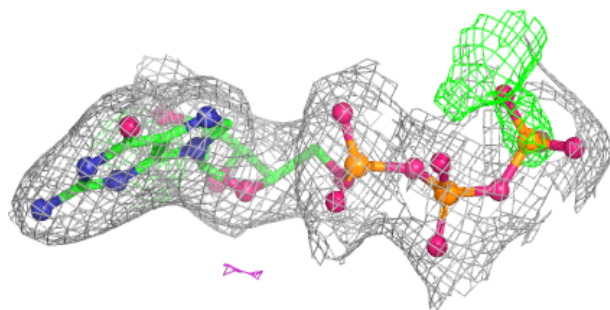
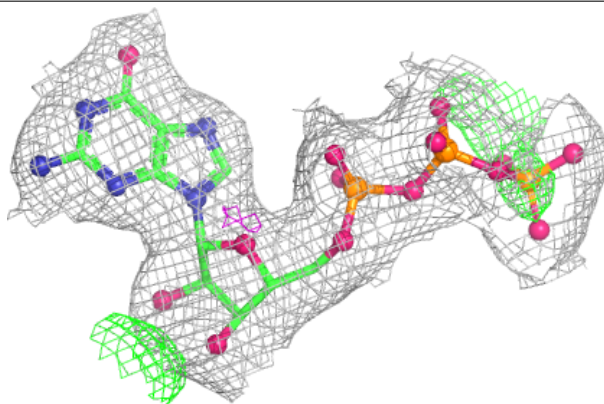


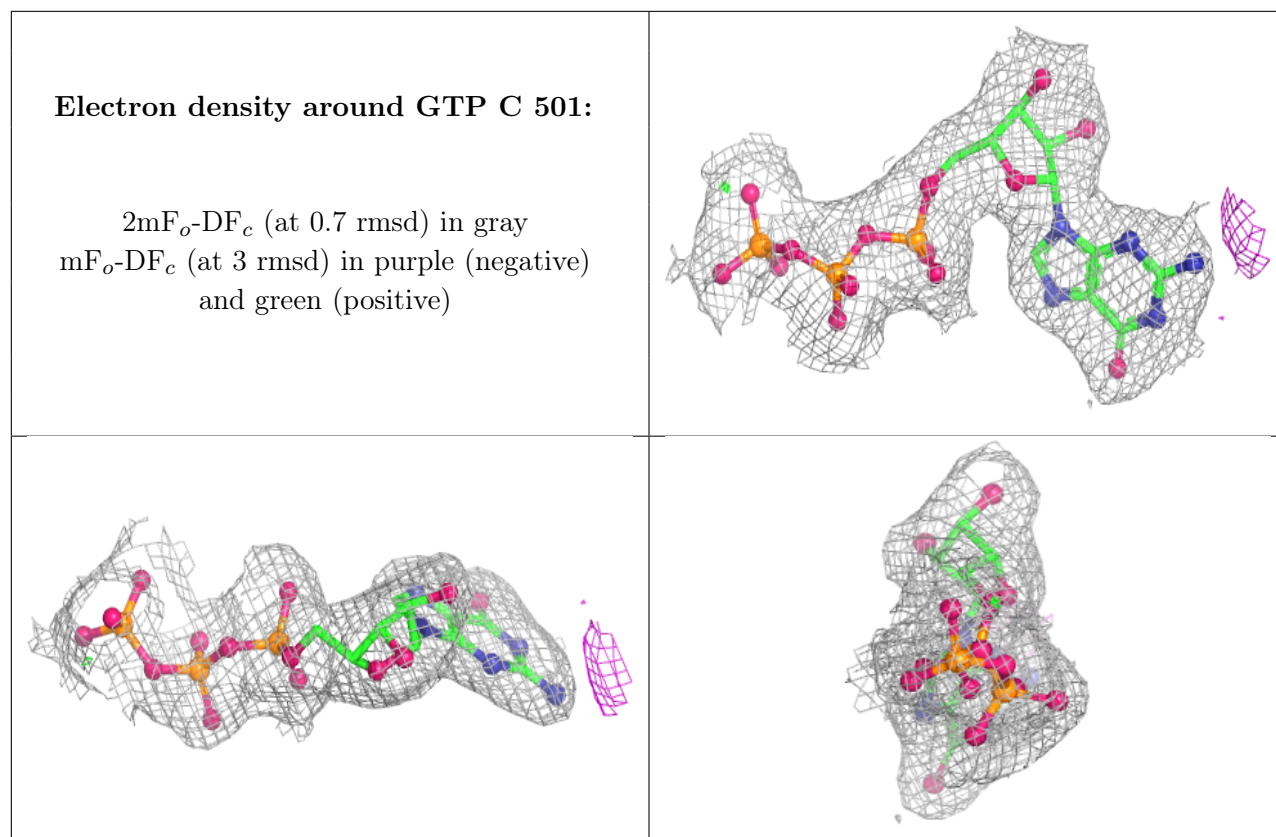
**Electron density around GDP D 501:**

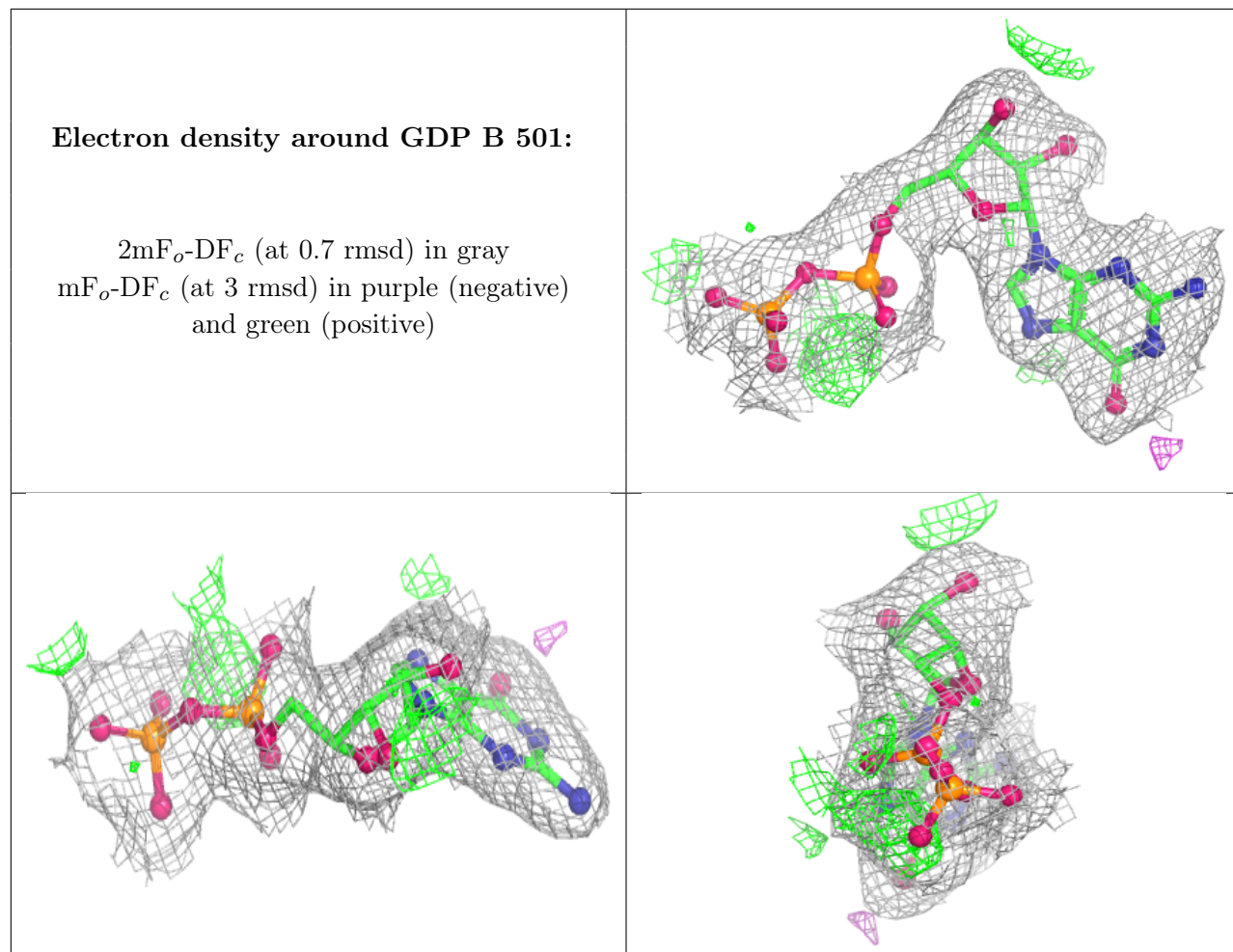
$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)

**Electron density around 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.