



# Full wwPDB X-ray Structure Validation Report ⓘ

Nov 20, 2023 – 02:08 PM JST

PDB ID : 7CNM  
Title : YDX in complex with tubulin  
Authors : Wang, Y.X.; Wu, C.Y.  
Deposited on : 2020-08-02  
Resolution : 2.44 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 : 4.02b-467  
Mogul : 1.8.5 (274361), CSD as541be (2020)  
Xtriage (Phenix) : 1.13  
EDS : 2.36  
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) : 2.36

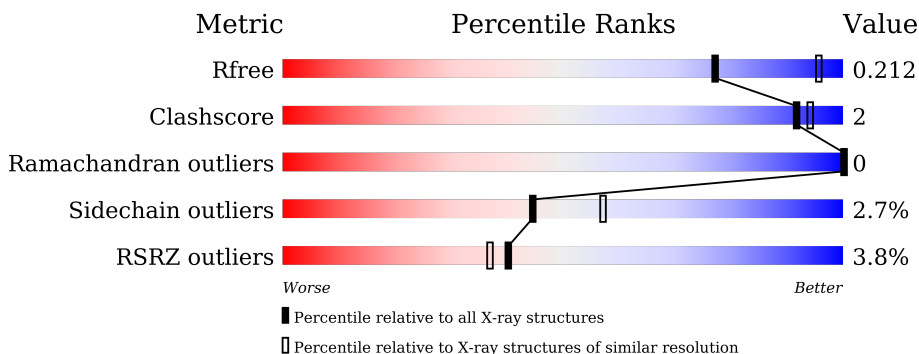
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.44 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	1564 (2.46-2.42)
Clashscore	141614	1631 (2.46-2.42)
Ramachandran outliers	138981	1617 (2.46-2.42)
Sidechain outliers	138945	1617 (2.46-2.42)
RSRZ outliers	127900	1547 (2.46-2.42)

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	<p>2% 90% 7% .</p>
1	C	451	<p>92% 5% .</p>
2	B	445	<p>1% 91% 5% .</p>
2	D	445	<p>4% 90% 5% 5%</p>
3	E	143	<p>5% 80% . 15%</p>
4	F	384	<p>11% 81% 7% 12%</p>

## 2 Entry composition i

There are 12 unique types of molecules in this entry. The entry contains 17919 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
			Total	C	N	O	S			
1	A	437	Total	C	N	O	S	0	0	0
			3416	2163	581	650	22			
1	C	440	Total	C	N	O	S	0	0	0
			3437	2175	584	656	22			

- Molecule 2 is a protein called Tubulin beta chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	428	Total	C	N	O	S	0	0	0
			3369	2115	577	650	27			
2	D	424	Total	C	N	O	S	0	0	0
			3333	2093	568	645	27			

- Molecule 3 is a protein called Stathmin-4.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
3	E	121	Total	C	N	O	S	0	0	0
			1000	617	181	197	5			

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
E	3	MET	-	initiating methionine	UNP P63042
E	4	ALA	-	expression tag	UNP P63042

- Molecule 4 is a protein called Tubulin tyrosine ligase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
4	F	338	Total	C	N	O	S	0	0	0
			2784	1785	482	503	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	
			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		

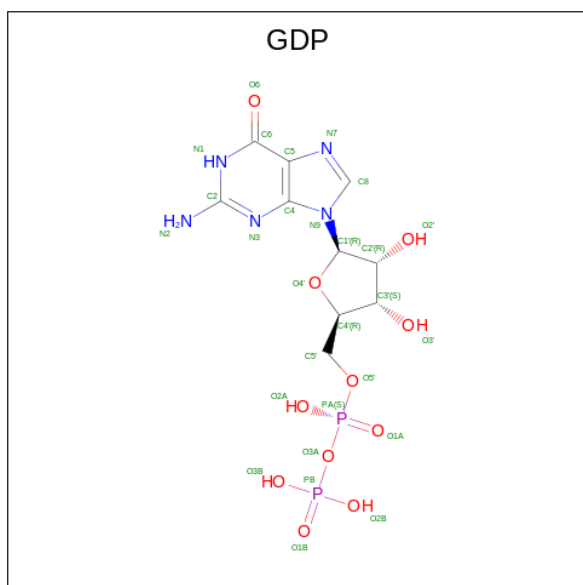
- Molecule 6 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	Mg		
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		

- Molecule 7 is CALCIUM ION (three-letter code: CA) (formula: Ca).

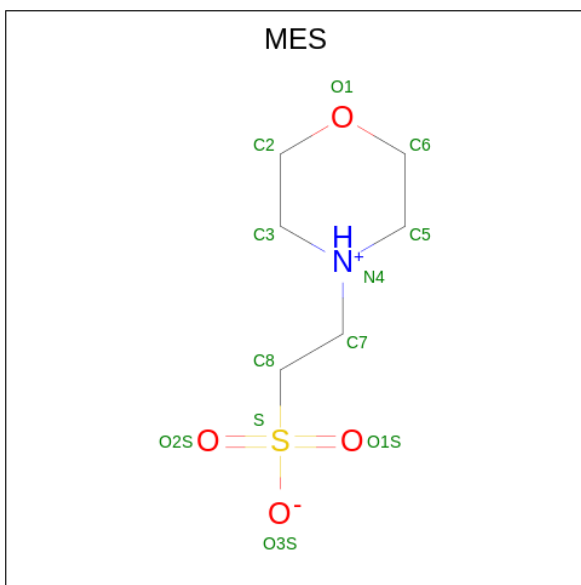
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
7	A	1	Total Ca 1 1	0	0
7	C	1	Total Ca 1 1	0	0

- Molecule 8 is GUANOSINE-5'-DIPHOSPHATE (three-letter code: GDP) (formula:  $C_{10}H_{15}N_5O_{11}P_2$ ).



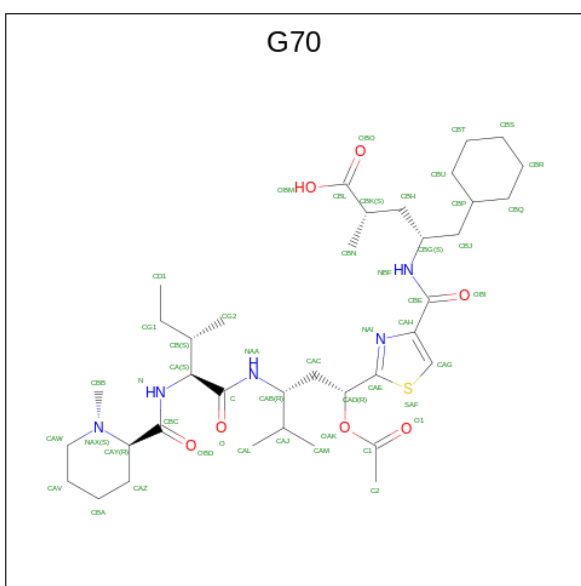
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
8	B	1	Total C N O P 28 10 5 11 2	0	0
8	D	1	Total C N O P 28 10 5 11 2	0	0

- Molecule 9 is 2-(N-MORPHOLINO)-ETHANESULFONIC ACID (three-letter code: MES) (formula:  $C_6H_{13}NO_4S$ ).



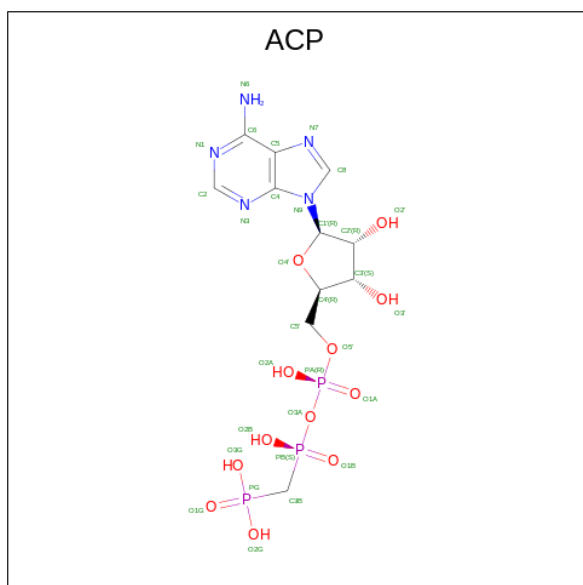
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	
			Total	C	N	O	S			
9	B	1	Total	12	6	1	4	1	0	0
9	B	1	Total	12	6	1	4	1	0	0
9	C	1	Total	12	6	1	4	1	0	0

- Molecule 10 is (2 {S},4 {S})-4-[[2-[(1 {R},3 {R})-1-acetyloxy-4-methyl-3-[(2 {S},3 {S})-3-methyl-2-[(2 {R})-1-methylpiperidin-2-yl]carbonylamino]pentanoyl]amino]pentyl]-1,3-t hiazol-4-yl]carbonylamino]-5-cyclohexyl-2-methyl-pentanoic acid (three-letter code: G70) (formula: C<sub>37</sub>H<sub>61</sub>N<sub>5</sub>O<sub>7</sub>S) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	S		
10	B	1	47	35	5	6	1	0	0
10	D	1	47	35	5	6	1	0	0

- Molecule 11 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
			Total	C	N	O	P		
11	F	1	31	11	5	12	3	0	0

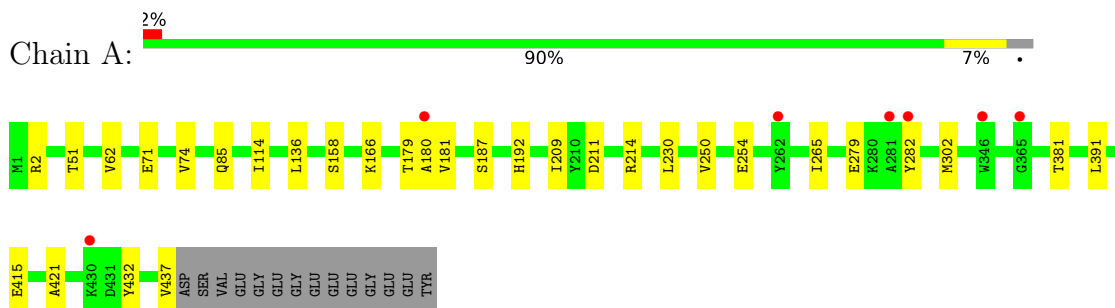
- Molecule 12 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
12	A	79	Total	O	0	0
			79	79		
12	B	66	Total	O	0	0
			66	66		
12	C	92	Total	O	0	0
			92	92		
12	D	18	Total	O	0	0
			18	18		
12	E	7	Total	O	0	0
			7	7		
12	F	32	Total	O	0	0
			32	32		

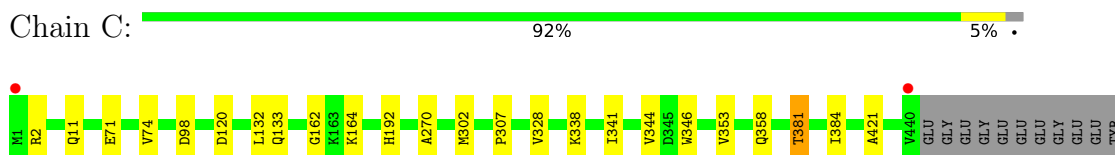
### 3 Residue-property plots [i](#)

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.

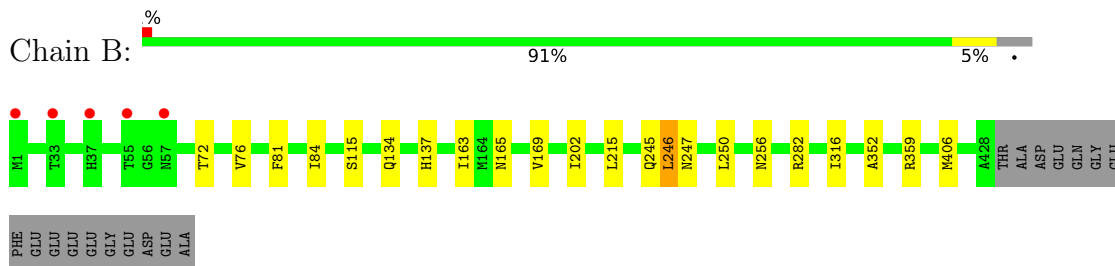
- Molecule 1: Tubulin alpha-1B chain



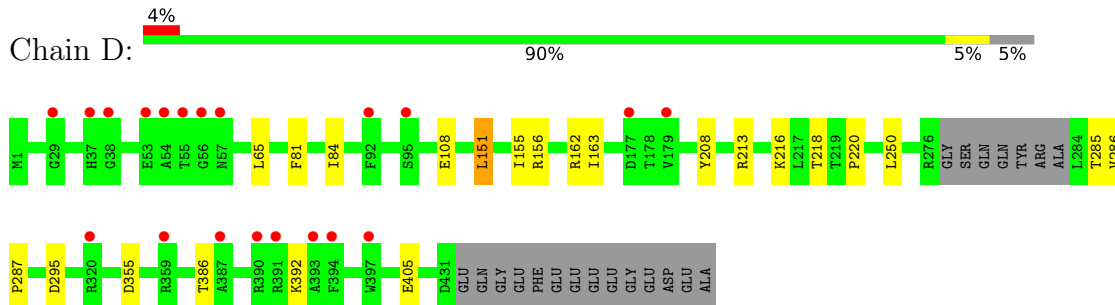
- Molecule 1: Tubulin alpha-1B chain



- Molecule 2: Tubulin beta chain

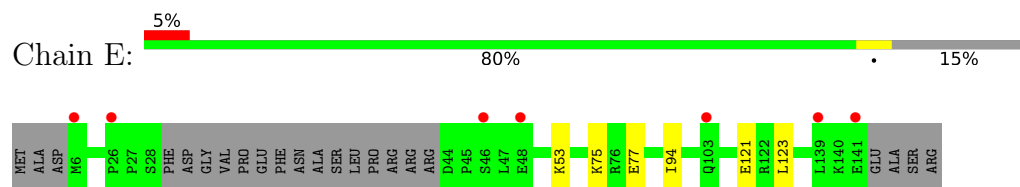


- Molecule 2: Tubulin beta chain

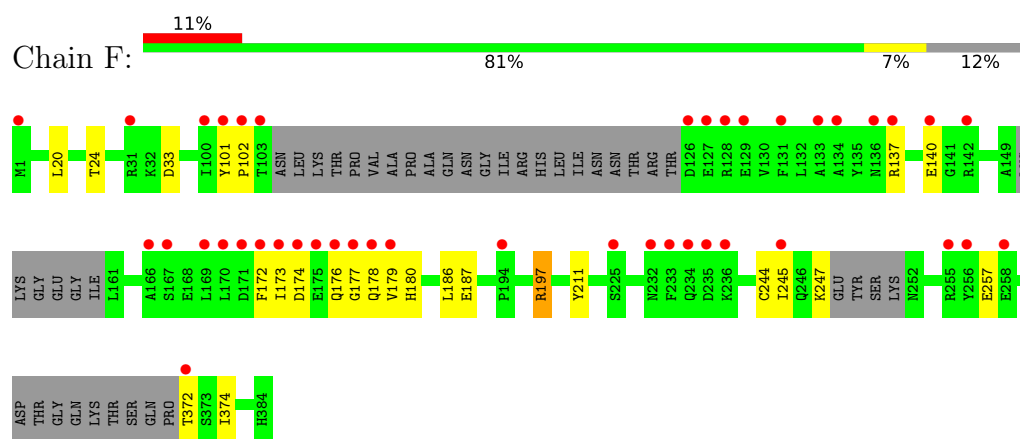




- Molecule 3: Stathmin-4



- Molecule 4: Tubulin tyrosine ligase



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	105.13Å 155.02Å 186.28Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	119.16 – 2.44 44.60 – 2.44	Depositor EDS
% Data completeness (in resolution range)	97.8 (119.16-2.44) 97.8 (44.60-2.44)	Depositor EDS
$R_{merge}$	0.07	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.60 (at 2.45Å)	Xtrriage
Refinement program	REFMAC 3.5	Depositor
R, $R_{free}$	0.201 , 0.237 0.205 , 0.212	Depositor DCC
$R_{free}$ test set	5427 reflections (4.88%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	35.6	Xtrriage
Anisotropy	0.042	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.33 , 34.3	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.94	EDS
Total number of atoms	17919	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	43.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.64% 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: GTP, MES, CA, GDP, MG, ACP, G70

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	0.43	0/3494	0.65	1/4743 (0.0%)
1	C	0.43	0/3515	0.66	0/4772
2	B	0.44	0/3444	0.64	0/4664
2	D	0.43	0/3406	0.63	0/4613
3	E	0.47	0/1008	0.64	0/1337
4	F	0.44	0/2850	0.65	0/3851
All	All	0.44	0/17717	0.65	1/23980 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	214	ARG	NE-CZ-NH1	5.41	123.01	120.30

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	3416	0	3331	10	0
1	C	3437	0	3348	11	0
2	B	3369	0	3250	10	0
2	D	3333	0	3214	9	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	E	1000	0	1018	1	0
4	F	2784	0	2737	16	0
5	A	32	0	12	0	0
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
7	A	1	0	0	0	0
7	C	1	0	0	0	0
8	B	28	0	12	0	0
8	D	28	0	12	0	0
9	B	24	0	26	0	0
9	C	12	0	13	0	0
10	B	47	0	0	0	0
10	D	47	0	0	0	0
11	F	31	0	14	0	0
12	A	79	0	0	0	0
12	B	66	0	0	0	0
12	C	92	0	0	2	0
12	D	18	0	0	0	0
12	E	7	0	0	0	0
12	F	32	0	0	0	0
All	All	17919	0	16999	54	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 2.

All (54) 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:D:81:PHE:O	2:D:84:ILE:HG22	1.78	0.83
2:B:246:LEU:HD22	2:B:247:ASN:N	1.98	0.77
1:A:179:THR:HG21	2:B:245:GLN:HG3	1.69	0.75
2:D:286:VAL:HG22	2:D:287:PRO:HD3	1.71	0.72
4:F:173:ILE:HG12	4:F:180:HIS:CD2	2.30	0.66
2:D:392:LYS:HE3	2:D:405:GLU:OE1	1.97	0.64
4:F:173:ILE:HG12	4:F:180:HIS:HD2	1.64	0.63
1:C:381:THR:HG23	12:C:619:HOH:O	1.99	0.62
4:F:102:PRO:HG3	4:F:177:GLY:O	2.02	0.60
1:C:71:GLU:HB2	1:C:98:ASP:HB3	1.86	0.58
4:F:102:PRO:CG	4:F:177:GLY:O	2.55	0.54

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:F:172:PHE:O	4:F:176:GLN:N	2.41	0.53
2:B:81:PHE:O	2:B:84:ILE:HG22	2.10	0.52
2:D:151:LEU:HD12	2:D:155:ILE:HD11	1.92	0.52
1:A:209:ILE:HD11	1:A:302:MET:SD	2.50	0.52
1:A:265:ILE:HG23	1:A:432:TYR:CE1	2.46	0.51
1:A:158:SER:OG	1:A:166:LYS:NZ	2.44	0.50
4:F:186:LEU:HD12	4:F:320:MET:HG2	1.94	0.50
1:C:270:ALA:HB3	1:C:302:MET:CE	2.41	0.50
2:D:285:THR:HB	2:D:287:PRO:HD2	1.94	0.50
1:A:209:ILE:HG23	1:A:230:LEU:HD23	1.92	0.49
4:F:173:ILE:HD11	4:F:180:HIS:HB3	1.94	0.49
2:D:208:TYR:CE1	2:D:220:PRO:HG2	2.46	0.49
2:B:169:VAL:HA	2:B:202:ILE:O	2.13	0.48
2:B:72:THR:O	2:B:76:VAL:HG23	2.13	0.48
1:C:11:GLN:HG3	1:C:74:VAL:HG21	1.95	0.48
2:B:246:LEU:HD22	2:B:246:LEU:C	2.34	0.47
4:F:173:ILE:O	4:F:174:ASP:C	2.52	0.47
4:F:172:PHE:O	4:F:176:GLN:HB2	2.15	0.47
4:F:101:TYR:HD1	4:F:179:VAL:HG13	1.80	0.46
1:C:328:VAL:HG11	1:C:353:VAL:HG11	1.98	0.46
4:F:244:CYS:SG	4:F:245:ILE:N	2.89	0.46
2:B:134:GLN:HA	2:B:165:ASN:O	2.15	0.45
4:F:101:TYR:CD1	4:F:179:VAL:HG13	2.52	0.45
2:D:163:ILE:HG21	2:D:250:LEU:HB3	1.99	0.45
1:A:180:ALA:HA	2:B:256:ASN:OD1	2.17	0.44
1:A:250:VAL:HG22	1:A:254:GLU:OE1	2.17	0.44
2:B:246:LEU:HD12	2:B:352:ALA:HB2	1.98	0.44
1:A:2:ARG:O	1:A:51:THR:HG23	2.18	0.44
4:F:178:GLN:H	4:F:178:GLN:CD	2.21	0.43
4:F:197:ARG:NH1	4:F:257:GLU:OE1	2.51	0.43
1:C:344:VAL:HG21	1:C:346:TRP:CE2	2.54	0.43
2:D:213:ARG:O	2:D:216:LYS:HD2	2.18	0.43
2:D:286:VAL:N	2:D:287:PRO:CD	2.82	0.43
2:B:163:ILE:HG21	2:B:250:LEU:HB3	2.00	0.42
1:A:187:SER:HB3	1:A:391:LEU:HD21	2.02	0.42
4:F:349:GLY:HA3	4:F:374:ILE:HD11	2.01	0.42
1:C:132:LEU:HD23	1:C:164:LYS:HD3	2.03	0.41
1:C:162:GLY:HA2	3:E:94:ILE:HD11	2.01	0.41
4:F:20:LEU:O	4:F:24:THR:HG23	2.20	0.41
1:C:307:PRO:HB3	1:C:381:THR:HG21	2.02	0.41
1:C:381:THR:CG2	12:C:619:HOH:O	2.65	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:192:HIS:CG	1:C:421:ALA:HA	2.57	0.40
1:A:192:HIS:CG	1:A:421:ALA:HA	2.57	0.40

There are no symmetry-related clashes.

## 5.3 Torsion angles [i](#)

### 5.3.1 Protein backbone [i](#)

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

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

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	435/451 (96%)	422 (97%)	13 (3%)	0	100	100
1	C	438/451 (97%)	430 (98%)	8 (2%)	0	100	100
2	B	426/445 (96%)	419 (98%)	7 (2%)	0	100	100
2	D	420/445 (94%)	414 (99%)	6 (1%)	0	100	100
3	E	117/143 (82%)	117 (100%)	0	0	100	100
4	F	328/384 (85%)	320 (98%)	8 (2%)	0	100	100
All	All	2164/2319 (93%)	2122 (98%)	42 (2%)	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	368/379 (97%)	355 (96%)	13 (4%)	36	47

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	C	371/379 (98%)	363 (98%)	8 (2%)	52	64
2	B	370/383 (97%)	362 (98%)	8 (2%)	52	64
2	D	367/383 (96%)	358 (98%)	9 (2%)	47	60
3	E	109/127 (86%)	104 (95%)	5 (5%)	27	35
4	F	305/342 (89%)	297 (97%)	8 (3%)	46	58
All	All	1890/1993 (95%)	1839 (97%)	51 (3%)	44	57

All (51) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	62	VAL
1	A	71	GLU
1	A	74	VAL
1	A	85	GLN
1	A	114	ILE
1	A	136	LEU
1	A	181	VAL
1	A	211	ASP
1	A	279	GLU
1	A	282	TYR
1	A	381	THR
1	A	415	GLU
1	A	437	VAL
2	B	115	SER
2	B	137	HIS
2	B	215	LEU
2	B	246	LEU
2	B	282	ARG
2	B	316	ILE
2	B	359	ARG
2	B	406	MET
1	C	2	ARG
1	C	120	ASP
1	C	133	GLN
1	C	338	LYS
1	C	341	ILE
1	C	358	GLN
1	C	381	THR
1	C	384	ILE
2	D	65	LEU

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Mol	Chain	Res	Type
2	D	108	GLU
2	D	151	LEU
2	D	156	ARG
2	D	162	ARG
2	D	218	THR
2	D	295	ASP
2	D	355	ASP
2	D	386	THR
3	E	53	LYS
3	E	75	LYS
3	E	77	GLU
3	E	121	GLU
3	E	123	LEU
4	F	33	ASP
4	F	137	ARG
4	F	140	GLU
4	F	187	GLU
4	F	197	ARG
4	F	211	TYR
4	F	247	LYS
4	F	372	THR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	301	GLN
1	C	11	GLN
1	C	356	ASN
2	D	8	GLN
4	F	180	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 monosaccharides in this entry.

## 5.6 Ligand geometry [i](#)

Of 15 ligands modelled in this entry, 5 are monoatomic - leaving 10 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	GTP	C	501	6	26,34,34	0.92	0	32,54,54	1.27	4 (12%)
11	ACP	F	401	-	27,33,33	1.48	6 (22%)	32,52,52	1.26	4 (12%)
9	MES	B	503	-	12,12,12	1.88	1 (8%)	14,16,16	6.77	6 (42%)
10	G70	B	505	-	47,49,52	1.40	3 (6%)	53,67,71	1.23	6 (11%)
8	GDP	D	501	-	24,30,30	0.96	0	30,47,47	1.06	2 (6%)
9	MES	C	504	-	12,12,12	1.95	1 (8%)	14,16,16	1.95	4 (28%)
9	MES	B	504	-	12,12,12	2.28	1 (8%)	14,16,16	1.29	1 (7%)
8	GDP	B	501	6	24,30,30	0.98	1 (4%)	30,47,47	1.01	2 (6%)
5	GTP	A	501	6	26,34,34	1.01	2 (7%)	32,54,54	1.14	2 (6%)
10	G70	D	502	-	47,49,52	1.41	3 (6%)	53,67,71	1.41	7 (13%)

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
5	GTP	C	501	6	-	6/18/38/38	0/3/3/3
11	ACP	F	401	-	-	4/15/38/38	0/3/3/3
9	MES	B	503	-	-	5/6/14/14	0/1/1/1
10	G70	B	505	-	-	2/46/73/77	0/3/3/3
8	GDP	D	501	-	-	3/12/32/32	0/3/3/3
9	MES	C	504	-	-	3/6/14/14	0/1/1/1

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
9	MES	B	504	-	-	0/6/14/14	0/1/1/1
8	GDP	B	501	6	-	3/12/32/32	0/3/3/3
5	GTP	A	501	6	-	4/18/38/38	0/3/3/3
10	G70	D	502	-	-	2/46/73/77	0/3/3/3

All (18) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
9	B	504	MES	C8-S	-7.55	1.66	1.77
10	D	502	G70	CAH-CBE	-6.45	1.34	1.50
9	C	504	MES	C8-S	-6.36	1.68	1.77
10	B	505	G70	CAH-CBE	-5.89	1.36	1.50
9	B	503	MES	C8-S	-5.73	1.69	1.77
10	B	505	G70	CAE-SAF	-4.24	1.60	1.73
11	F	401	ACP	PB-O3A	3.18	1.61	1.58
11	F	401	ACP	PG-O2G	3.10	1.62	1.54
10	D	502	G70	CAE-SAF	-3.00	1.64	1.73
11	F	401	ACP	PG-O3G	2.97	1.61	1.54
10	D	502	G70	CAC-CAB	2.55	1.56	1.52
11	F	401	ACP	C5-C4	2.52	1.47	1.40
8	B	501	GDP	C6-N1	-2.38	1.34	1.37
5	A	501	GTP	O4'-C1'	2.28	1.44	1.41
11	F	401	ACP	PB-O2B	2.27	1.61	1.56
11	F	401	ACP	C2-N3	2.22	1.35	1.32
10	B	505	G70	CAC-CAB	2.18	1.56	1.52
5	A	501	GTP	C6-N1	-2.15	1.34	1.37

All (38) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
9	B	503	MES	O2S-S-C8	-15.71	88.00	106.92
9	B	503	MES	O1S-S-C8	12.78	122.30	106.92
9	B	503	MES	O3S-S-O2S	-9.99	86.87	111.27
9	B	503	MES	O2S-S-O1S	-9.08	82.52	113.95
9	B	503	MES	O3S-S-O1S	5.32	124.26	111.27
9	C	504	MES	O1S-S-C8	5.17	113.14	106.92
10	D	502	G70	CBA-CAV-CAW	-4.00	103.46	111.19
10	D	502	G70	CAH-CAG-SAF	-3.83	107.08	111.79
9	B	503	MES	O3S-S-C8	3.68	111.73	105.77
11	F	401	ACP	N3-C2-N1	-3.66	122.96	128.68
9	B	504	MES	O3S-S-C8	3.50	111.43	105.77

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
10	B	505	G70	CAH-CAG-SAF	-3.03	108.07	111.79
10	B	505	G70	CBA-CAV-CAW	-2.95	105.48	111.19
10	D	502	G70	CAH-CBE-NBF	2.80	120.39	115.20
5	C	501	GTP	O6-C6-C5	-2.78	118.94	124.37
10	B	505	G70	CAZ-CAY-CBC	-2.75	107.12	112.12
11	F	401	ACP	C4-C5-N7	-2.73	106.56	109.40
9	C	504	MES	O3S-S-C8	2.67	110.09	105.77
10	B	505	G70	CBJ-CBP-CBU	2.61	117.40	111.73
5	C	501	GTP	O3G-PG-O2G	2.61	117.59	107.64
5	A	501	GTP	C5-C6-N1	2.60	118.55	113.95
8	B	501	GDP	C5-C6-N1	2.51	118.38	113.95
5	C	501	GTP	C5-C6-N1	2.50	118.37	113.95
10	D	502	G70	CBS-CBR-CBQ	-2.43	106.46	111.42
8	D	501	GDP	C8-N7-C5	2.33	107.44	102.99
10	D	502	G70	CBA-CAZ-CAY	-2.31	106.92	111.23
5	A	501	GTP	O6-C6-C5	-2.31	119.86	124.37
8	B	501	GDP	O6-C6-C5	-2.28	119.92	124.37
10	B	505	G70	CAC-CAB-NAA	-2.28	107.24	110.18
10	D	502	G70	CAZ-CAY-CBC	-2.22	108.09	112.12
10	B	505	G70	CAH-CBE-NBF	2.21	119.31	115.20
10	D	502	G70	CBJ-CBP-CBU	2.16	116.44	111.73
8	D	501	GDP	C5-C6-N1	2.12	117.70	113.95
5	C	501	GTP	PA-O3A-PB	-2.10	125.61	132.83
11	F	401	ACP	C3'-C2'-C1'	2.09	104.13	100.98
11	F	401	ACP	C2-N1-C6	2.04	122.25	118.75
9	C	504	MES	O3S-S-O1S	-2.02	106.33	111.27
9	C	504	MES	C2-C3-N4	2.01	113.14	110.10

There are no chirality outliers.

All (32) 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-O1A
5	A	501	GTP	C5'-O5'-PA-O2A
5	C	501	GTP	PB-O3B-PG-O2G
5	C	501	GTP	PB-O3B-PG-O3G
5	C	501	GTP	C5'-O5'-PA-O1A
5	C	501	GTP	C5'-O5'-PA-O2A
8	B	501	GDP	C5'-O5'-PA-O1A
8	D	501	GDP	C5'-O5'-PA-O1A
9	B	503	MES	N4-C7-C8-S

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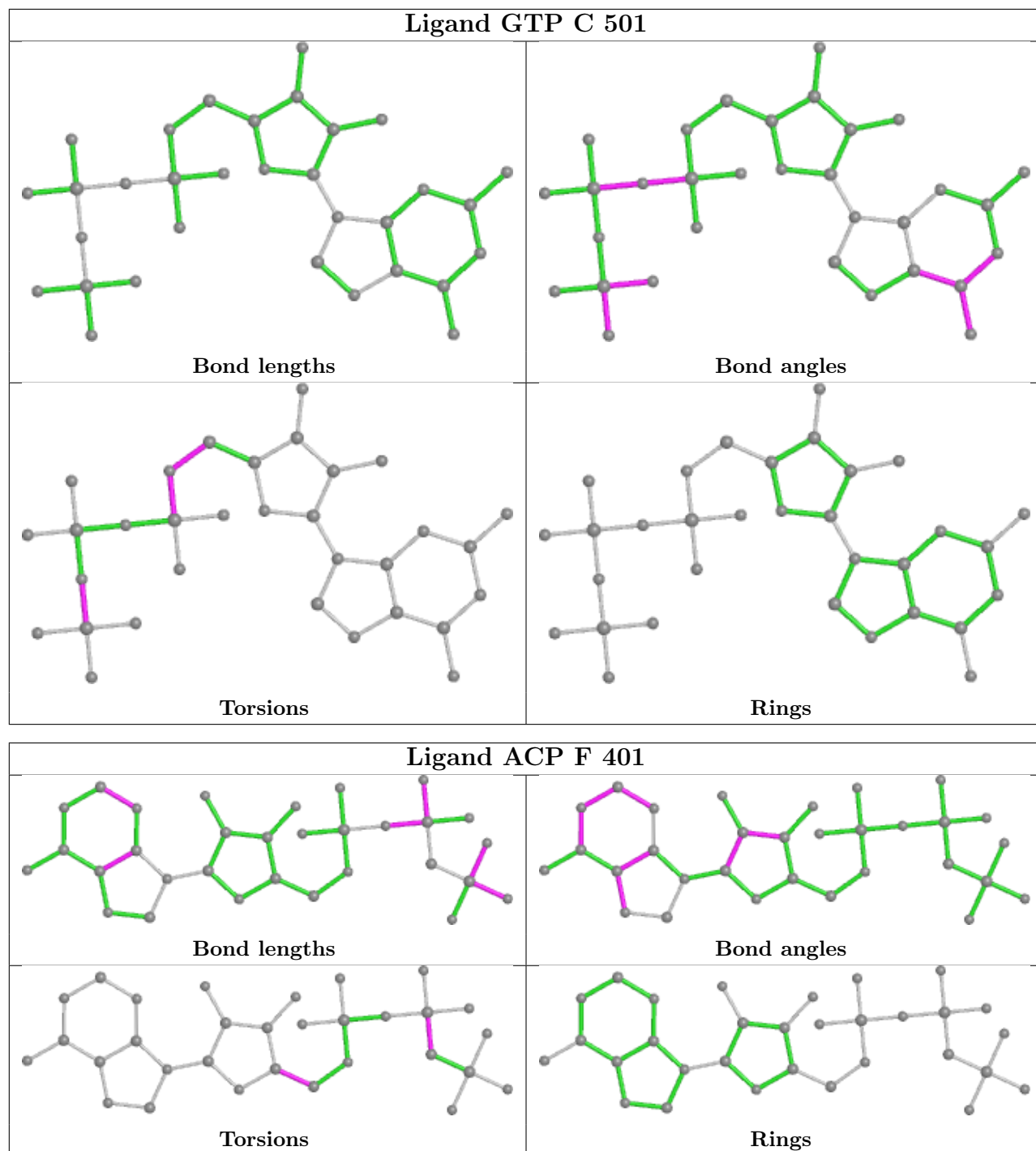
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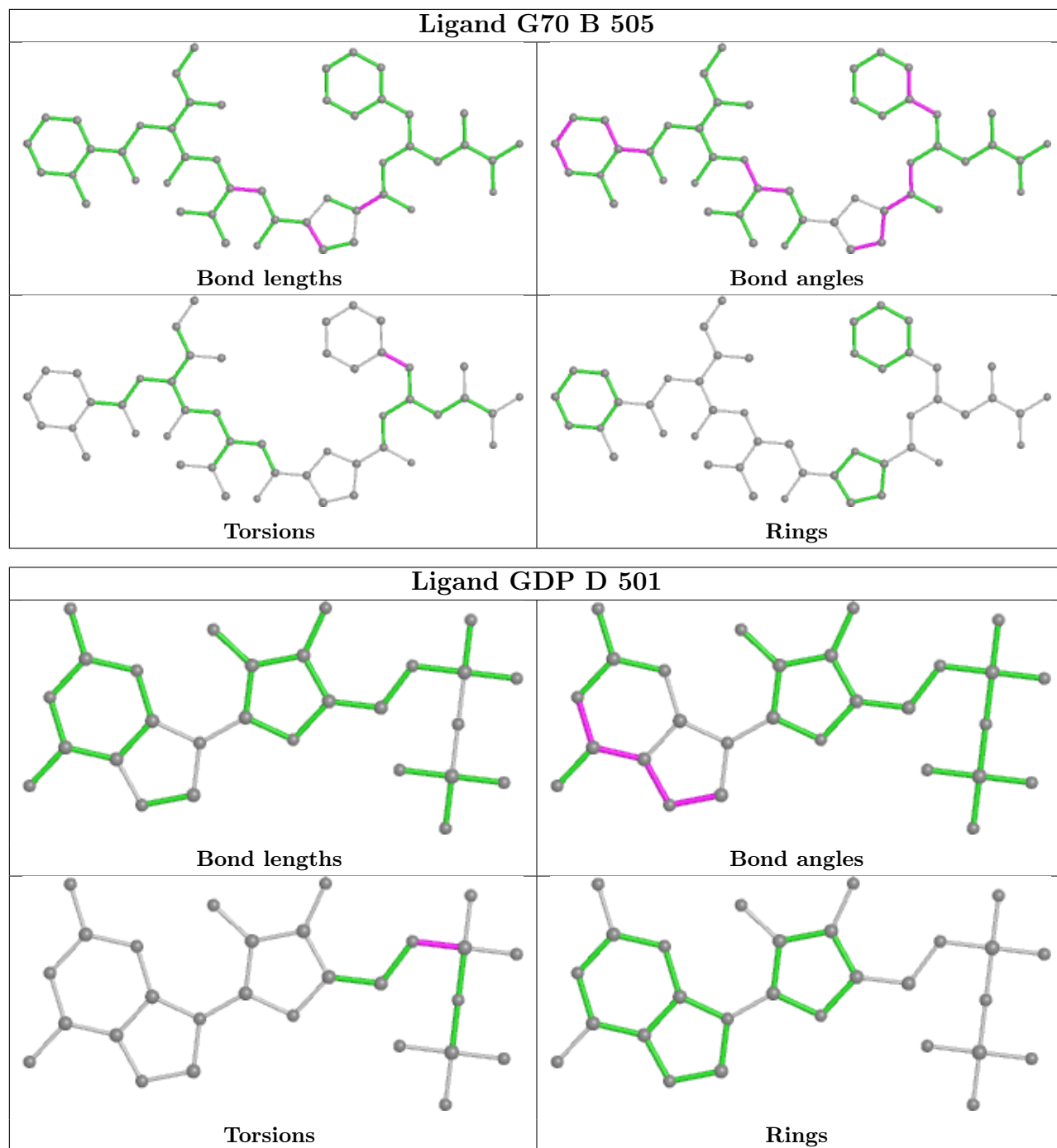
Mol	Chain	Res	Type	Atoms
9	B	503	MES	C7-C8-S-O3S
9	C	504	MES	C7-C8-S-O2S
9	C	504	MES	C7-C8-S-O3S
10	B	505	G70	CBG-CBJ-CBP-CBQ
10	B	505	G70	CBG-CBJ-CBP-CBU
10	D	502	G70	CBG-CBJ-CBP-CBU
11	F	401	ACP	PG-C3B-PB-O1B
11	F	401	ACP	PG-C3B-PB-O3A
10	D	502	G70	CBG-CBJ-CBP-CBQ
9	B	503	MES	C8-C7-N4-C3
8	B	501	GDP	C5'-O5'-PA-O2A
8	D	501	GDP	C5'-O5'-PA-O2A
9	B	503	MES	C7-C8-S-O2S
9	C	504	MES	C7-C8-S-O1S
9	B	503	MES	C8-C7-N4-C5
11	F	401	ACP	O4'-C4'-C5'-O5'
5	A	501	GTP	C5'-O5'-PA-O3A
5	C	501	GTP	C5'-O5'-PA-O3A
8	B	501	GDP	C5'-O5'-PA-O3A
8	D	501	GDP	C5'-O5'-PA-O3A
11	F	401	ACP	C3'-C4'-C5'-O5'
5	C	501	GTP	C4'-C5'-O5'-PA

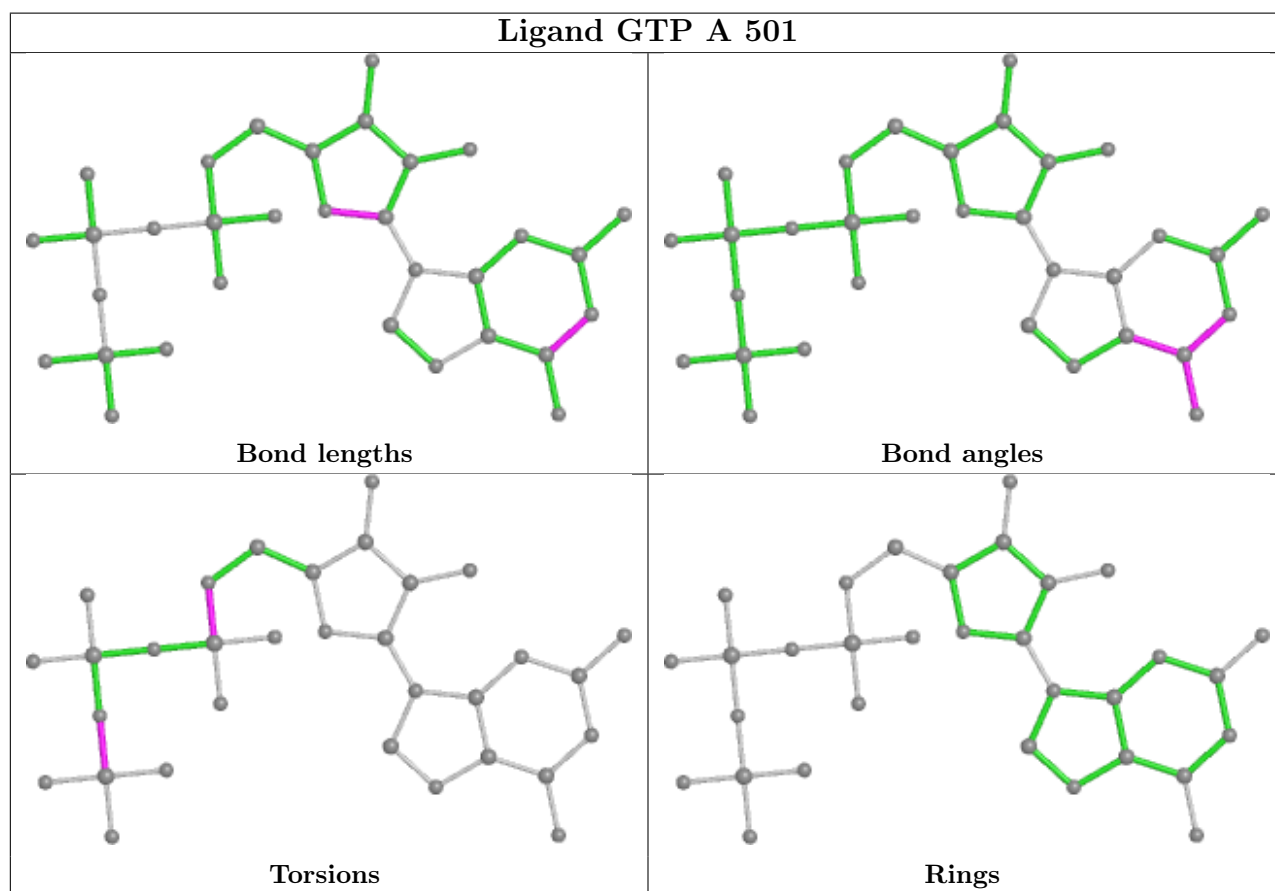
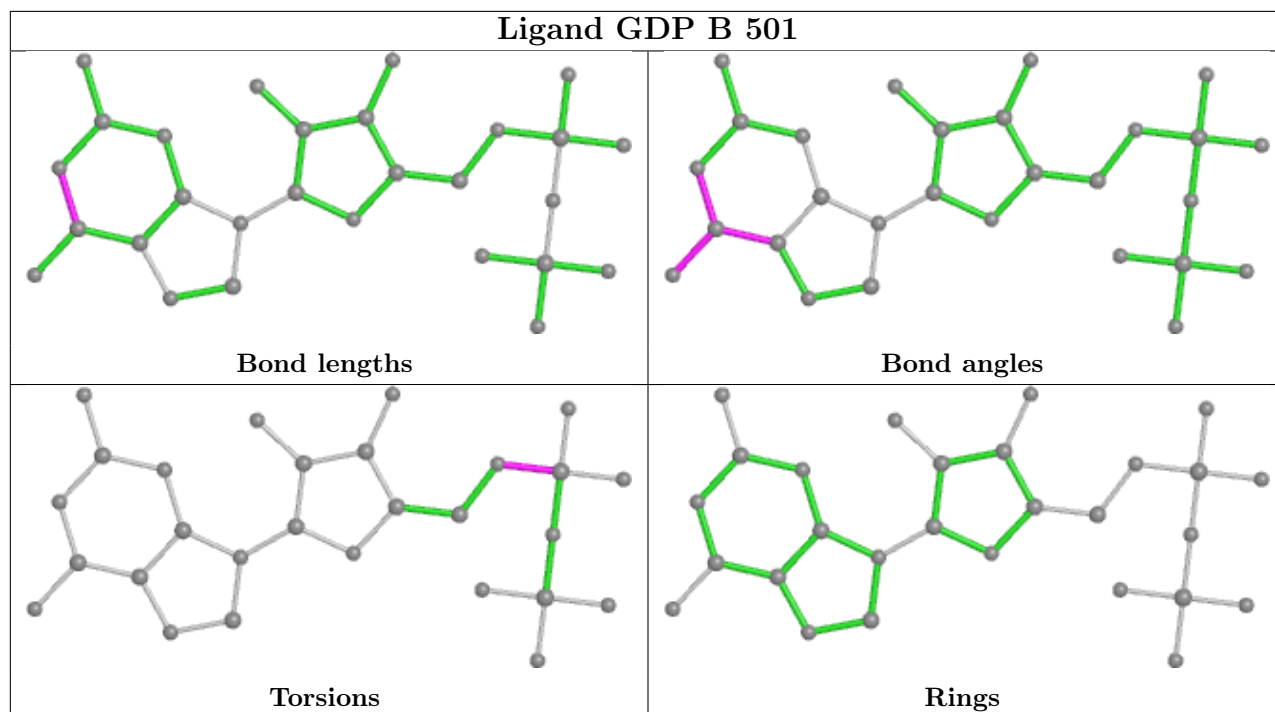
There are no ring outliers.

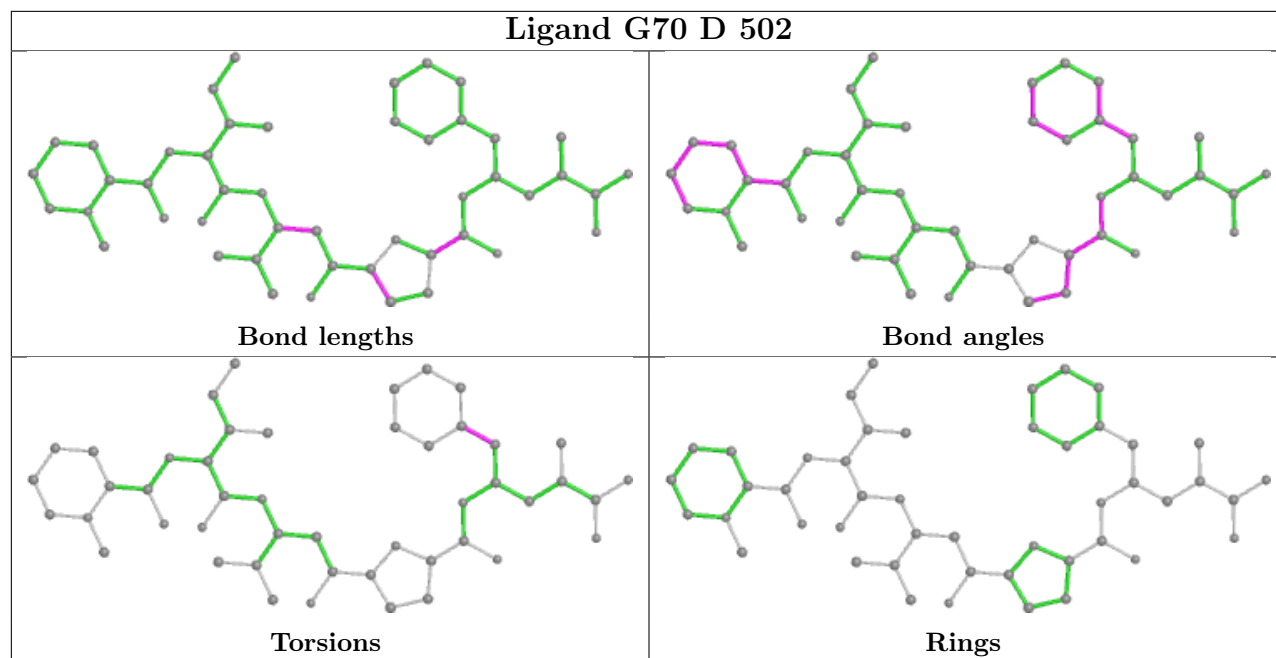
No monomer is involved in short contacts.

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

### 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	437/451 (96%)	-0.12	7 (1%) 72 69	20, 36, 59, 93	0
1	C	440/451 (97%)	-0.34	2 (0%) 91 91	17, 29, 50, 83	0
2	B	428/445 (96%)	-0.18	5 (1%) 79 77	17, 32, 63, 99	0
2	D	424/445 (95%)	0.21	20 (4%) 31 29	26, 48, 82, 106	0
3	E	121/143 (84%)	0.48	7 (5%) 23 19	31, 53, 81, 101	0
4	F	338/384 (88%)	0.44	43 (12%) 3 2	26, 53, 108, 134	0
All	All	2188/2319 (94%)	0.01	84 (3%) 40 37	17, 39, 81, 134	0

All (84) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
4	F	137	ARG	6.9
4	F	234	GLN	6.4
2	B	1	MET	6.1
2	D	55	THR	5.5
4	F	103	THR	5.3
1	A	282	TYR	5.0
4	F	178	GLN	4.9
4	F	372	THR	4.6
4	F	140	GLU	4.3
4	F	179	VAL	4.1
3	E	6	MET	4.0
4	F	236	LYS	4.0
4	F	175	GLU	4.0
4	F	255	ARG	3.9
4	F	176	GLN	3.9
4	F	101	TYR	3.9
4	F	256	TYR	3.9
2	D	391	ARG	3.8
2	D	359	ARG	3.7

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>	<b>RSRZ</b>
4	F	173	ILE	3.7
2	D	37	HIS	3.7
4	F	166	ALA	3.7
1	A	281	ALA	3.6
4	F	171	ASP	3.6
4	F	102	PRO	3.5
2	D	390	ARG	3.5
4	F	232	ASN	3.4
4	F	142	ARG	3.4
1	C	1	MET	3.3
4	F	131	PHE	3.2
2	D	92	PHE	3.2
4	F	167	SER	3.1
4	F	172	PHE	3.1
2	D	95	SER	3.1
4	F	100	ILE	3.1
3	E	48	GLU	3.0
4	F	133	ALA	3.0
4	F	177	GLY	3.0
4	F	233	PHE	3.0
2	D	320	ARG	3.0
4	F	245	ILE	2.9
4	F	129	GLU	2.9
4	F	235	ASP	2.9
4	F	170	LEU	2.8
3	E	139	LEU	2.8
4	F	174	ASP	2.7
2	D	177	ASP	2.7
4	F	127	GLU	2.7
4	F	136	ASN	2.6
1	A	346	TRP	2.6
2	D	54	ALA	2.6
2	D	397	TRP	2.6
1	A	365	GLY	2.6
4	F	362	ALA	2.5
2	D	57	ASN	2.5
2	D	394	PHE	2.5
4	F	225	SER	2.4
1	C	440	VAL	2.4
1	A	430	LYS	2.4
4	F	126	ASP	2.4
2	D	38	GLY	2.4

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Mol	Chain	Res	Type	RSRZ
2	D	387	ALA	2.3
4	F	134	ALA	2.3
4	F	128	ARG	2.3
2	D	53	GLU	2.3
2	B	55	THR	2.3
4	F	31	ARG	2.3
4	F	194	PRO	2.2
3	E	46	SER	2.2
1	A	262	TYR	2.2
2	D	179	VAL	2.2
2	B	57	ASN	2.2
1	A	180	ALA	2.2
2	D	393	ALA	2.2
2	D	29	GLY	2.2
4	F	169	LEU	2.1
4	F	258	GLU	2.1
3	E	103	GLN	2.1
3	E	26	PRO	2.1
2	B	37	HIS	2.0
4	F	1	MET	2.0
2	B	33	THR	2.0
2	D	56	GLY	2.0
3	E	141	GLU	2.0

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

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

## 6.3 Carbohydrates [i](#)

There are no monosaccharides in this entry.

## 6.4 Ligands [i](#)

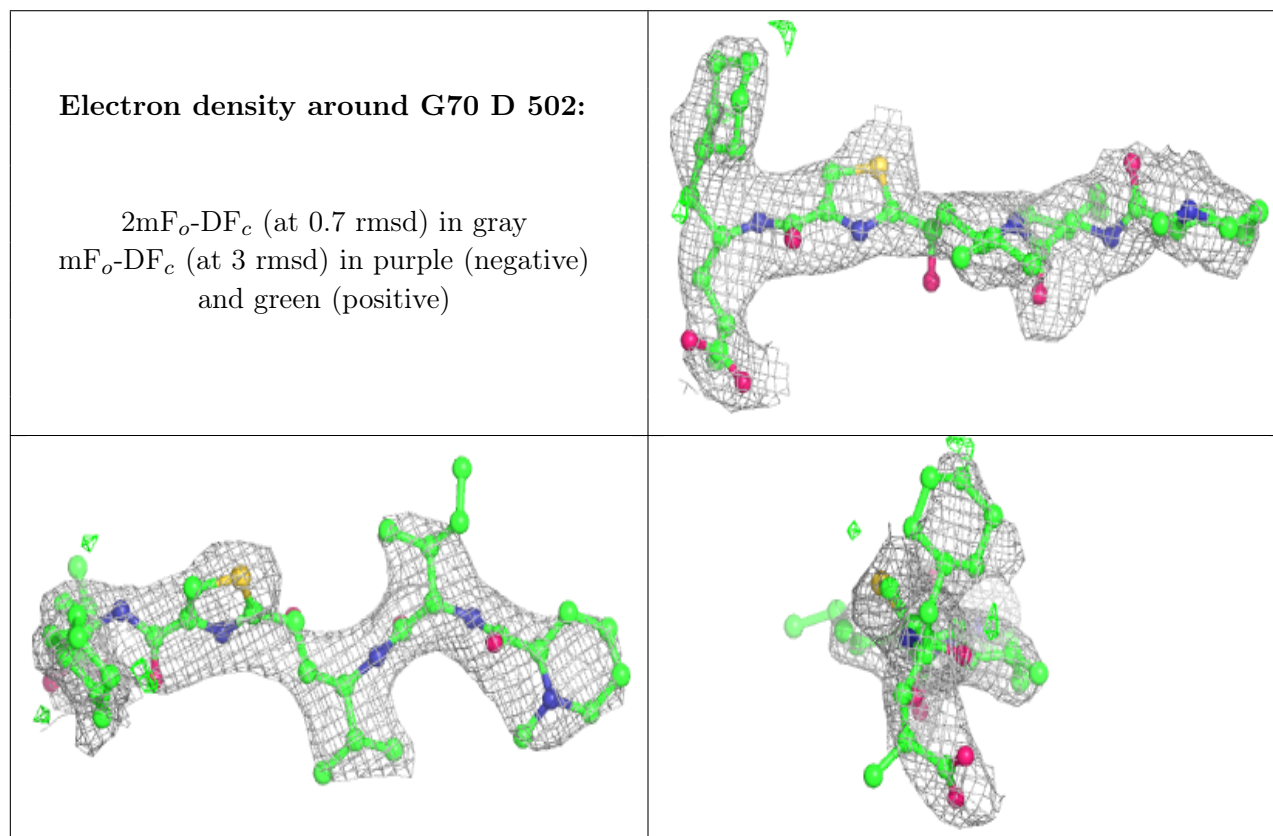
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95<sup>th</sup> percentile and maximum values of B factors of atoms in the group. The column labelled 'Q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

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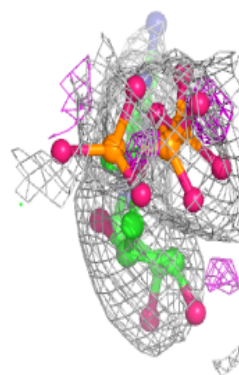
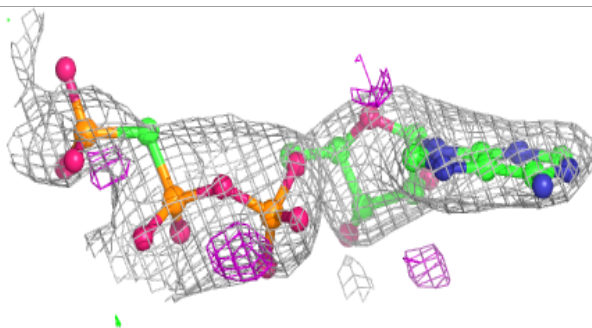
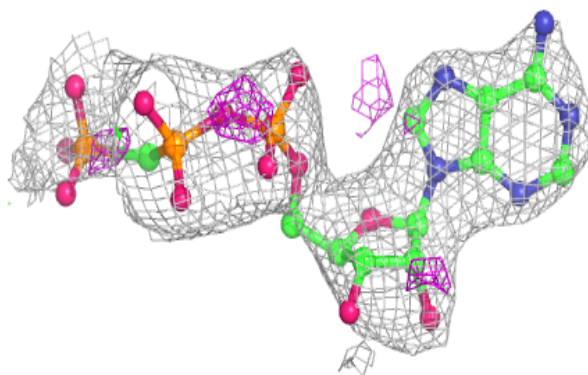
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å <sup>2</sup> )	Q<0.9
9	MES	C	504	12/12	0.66	0.39	91,94,107,115	0
10	G70	D	502	47/50	0.80	0.33	72,87,90,91	0
9	MES	B	503	12/12	0.87	0.18	60,66,74,74	0
11	ACP	F	401	31/31	0.88	0.19	61,68,105,106	0
8	GDP	D	501	28/28	0.94	0.12	37,39,44,44	0
10	G70	B	505	47/50	0.95	0.14	25,30,47,48	0
9	MES	B	504	12/12	0.95	0.16	40,41,42,42	0
6	MG	A	502	1/1	0.95	0.09	31,31,31,31	0
7	CA	A	503	1/1	0.97	0.06	50,50,50,50	0
7	CA	C	503	1/1	0.97	0.04	37,37,37,37	0
6	MG	B	502	1/1	0.97	0.14	34,34,34,34	0
8	GDP	B	501	28/28	0.98	0.14	19,20,21,22	0
6	MG	C	502	1/1	0.98	0.11	23,23,23,23	0
5	GTP	A	501	32/32	0.98	0.16	19,22,24,25	0
5	GTP	C	501	32/32	0.98	0.12	17,19,20,21	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.

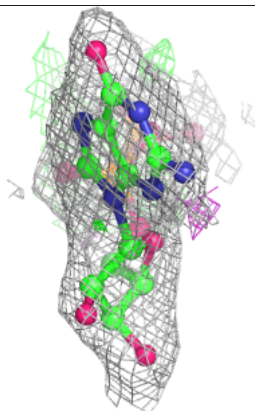
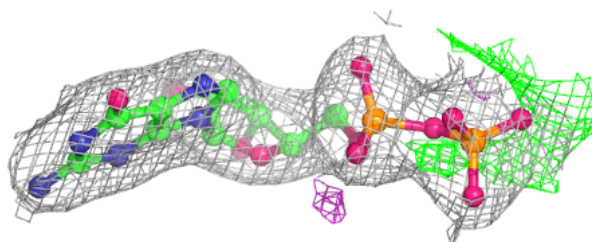
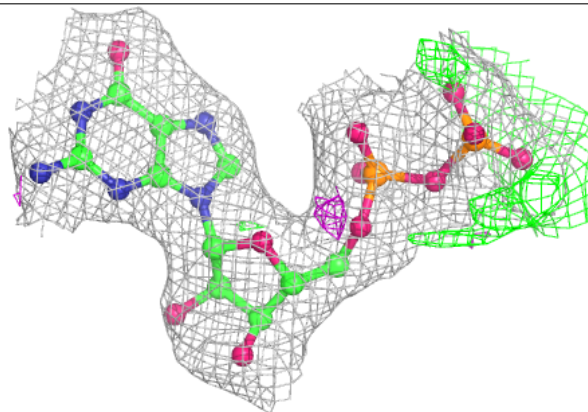


**Electron density around ACP F 401:**

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

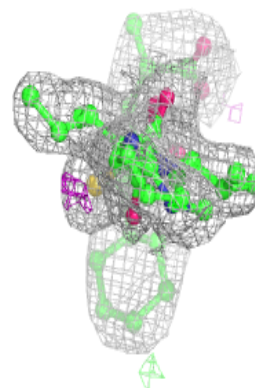
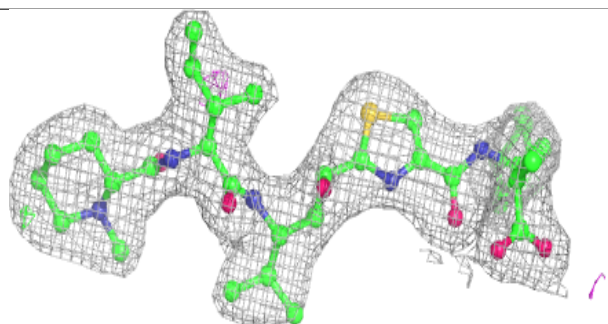
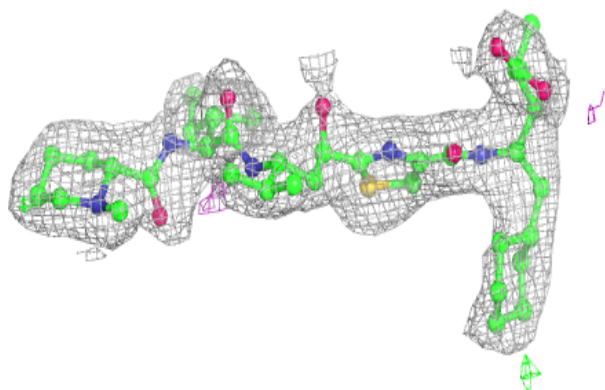
**Electron density around GDP D 501:**

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

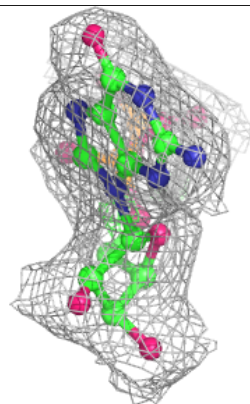
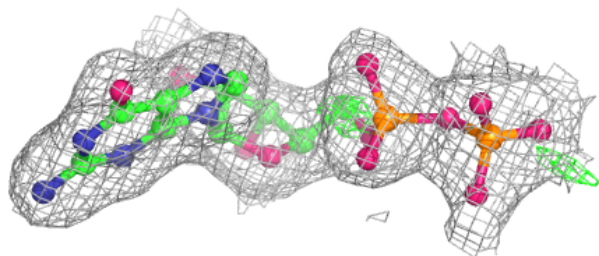
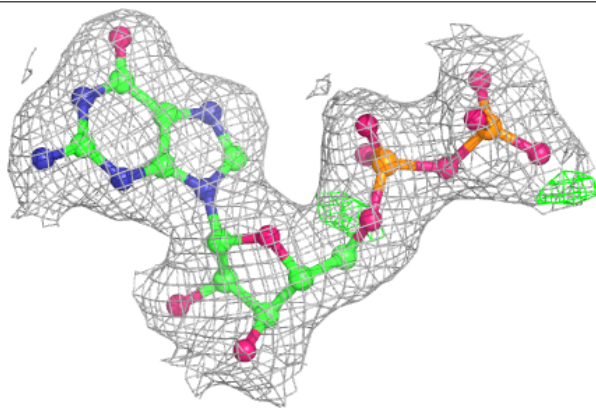


**Electron density around G70 B 505:**

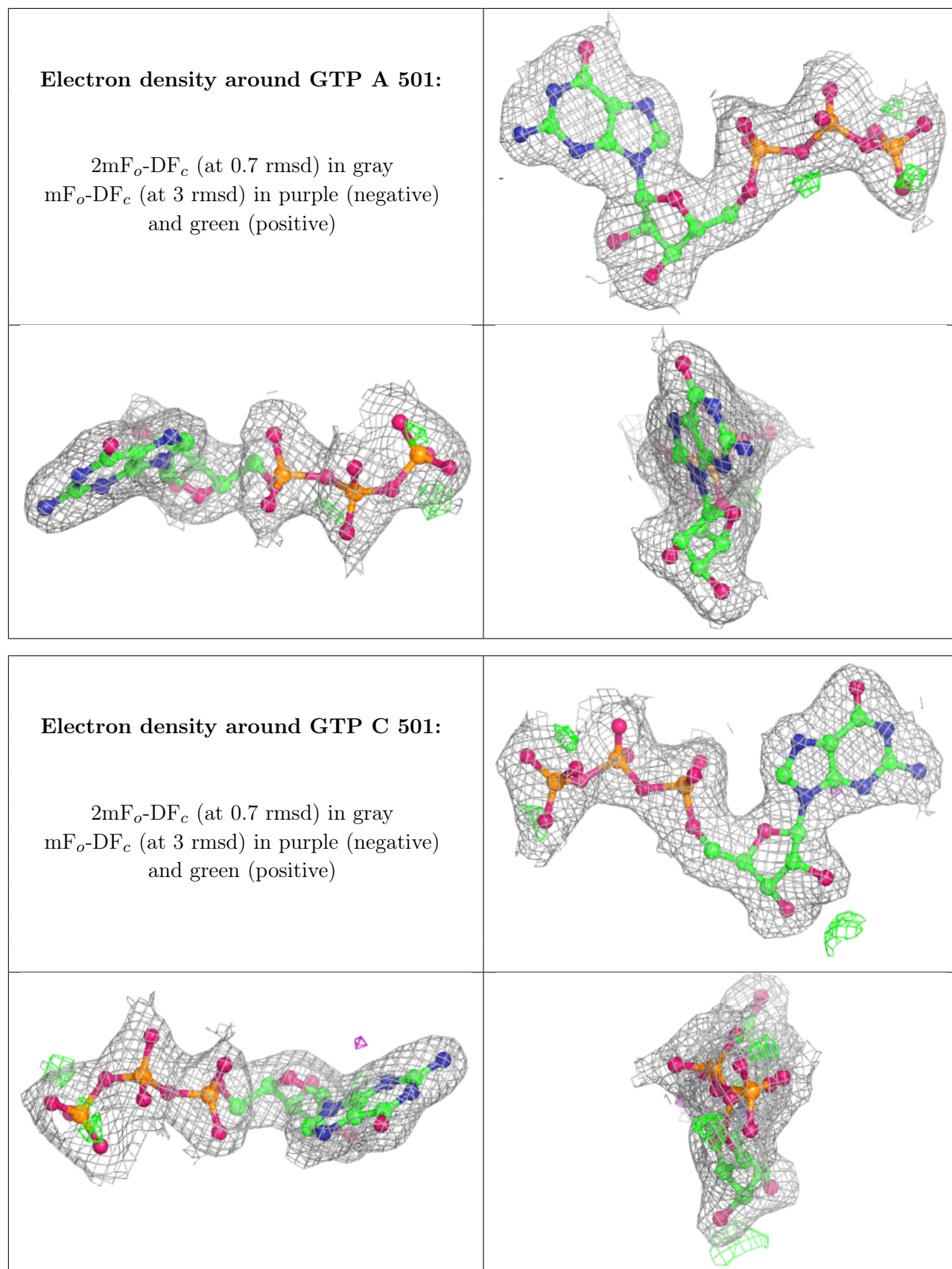
$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)

**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)







## 6.5 Other polymers [i](#)

There are no such residues in this entry.