



# wwPDB X-ray Structure Validation Summary Report ⓘ

May 15, 2024 – 12:06 pm BST

PDB ID : 8R67  
Title : tubulin-cryptophycin complex  
Authors : Abel, A.C.; Muehlethaler, T.; Dessin, C.; Steinmetz, M.O.; Sewald, N.; Prota, A.E.  
Deposited on : 2023-11-21  
Resolution : 2.20 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)

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

---

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

MolProbity : 4.02b-467  
Mogul : 1.8.4, CSD as541be (2020)  
Xtriage (Phenix) : 1.13  
EDS : 2.36.2  
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) : 2.36.2

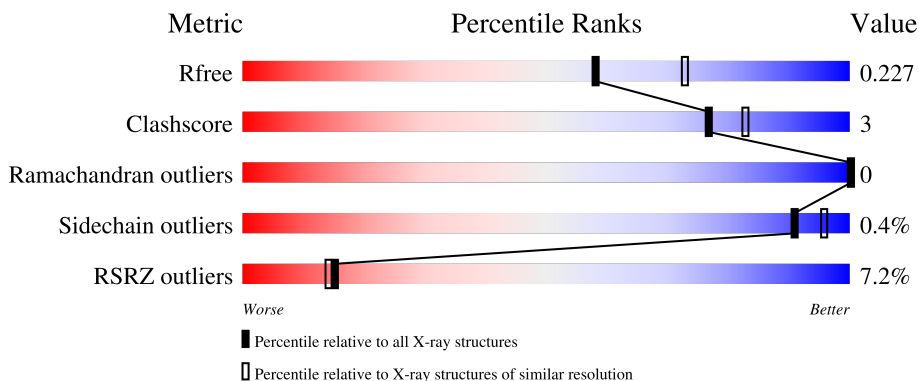
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

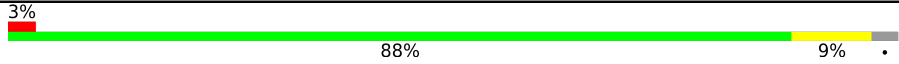
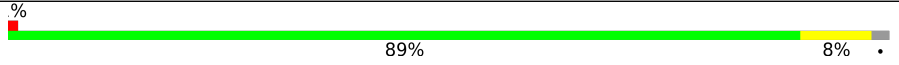



The reported resolution of this entry is 2.20 Å.

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.



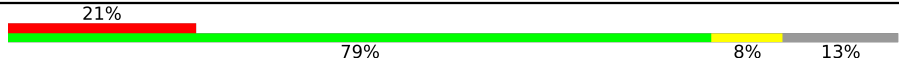
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
$R_{free}$	130704	4898 (2.20-2.20)
Clashscore	141614	5594 (2.20-2.20)
Ramachandran outliers	138981	5503 (2.20-2.20)
Sidechain outliers	138945	5504 (2.20-2.20)
RSRZ outliers	127900	4800 (2.20-2.20)

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	
3	E	143	

Continued on next page...

*Continued from previous page...*

Mol	Chain	Length	Quality of chain
4	F	384	 <p>A horizontal bar chart showing the quality distribution of chain F. The bar is divided into four segments: a red segment representing 21%, a green segment representing 79%, a yellow segment representing 8%, and a grey segment representing 13%.</p>

## 2 Entry composition [i](#)

There are 14 unique types of molecules in this entry. The entry contains 18309 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 Detyrosinated 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	7	0
			3463	2191	591	657	24			
1	C	440	Total	C	N	O	S	0	8	0
			3482	2206	588	664	24			

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

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	425	Total	C	N	O	S	0	4	0
			3368	2115	573	653	27			
2	D	426	Total	C	N	O	S	0	1	0
			3348	2102	570	648	28			

- 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	3	0
			1027	634	185	202	6			

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
E	3	MET	-	initiating methionine	UNP P63043
E	4	ALA	-	expression tag	UNP P63043

- Molecule 4 is a protein called Tubulin tyrosine ligase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
4	F	334	Total	C	N	O	S	0	3	0
			2770	1781	471	502	16			

There are 6 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
F	379	HIS	-	expression tag	UNP A0A8V0Z8P0
F	380	HIS	-	expression tag	UNP A0A8V0Z8P0
F	381	HIS	-	expression tag	UNP A0A8V0Z8P0
F	382	HIS	-	expression tag	UNP A0A8V0Z8P0
F	383	HIS	-	expression tag	UNP A0A8V0Z8P0
F	384	HIS	-	expression tag	UNP A0A8V0Z8P0

- 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		
6	D	1	Total	Mg	0	0
			1	1		

Continued on next page...

Continued from previous page...

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	F	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	2	Total	Ca	0	0
			2	2		
7	B	1	Total	Ca	0	0
			1	1		
7	C	1	Total	Ca	0	0
			1	1		

- Molecule 8 is GUANOSINE-5'-DIPHOSPHATE (three-letter code: 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
8	B	1	Total	C	N	O	P	0	0
			28	10	5	11	2		
8	D	1	Total	C	N	O	P	0	0
			28	10	5	11	2		

- Molecule 9 is IMIDAZOLE (three-letter code: IMD) (formula: C<sub>3</sub>H<sub>5</sub>N<sub>2</sub>).



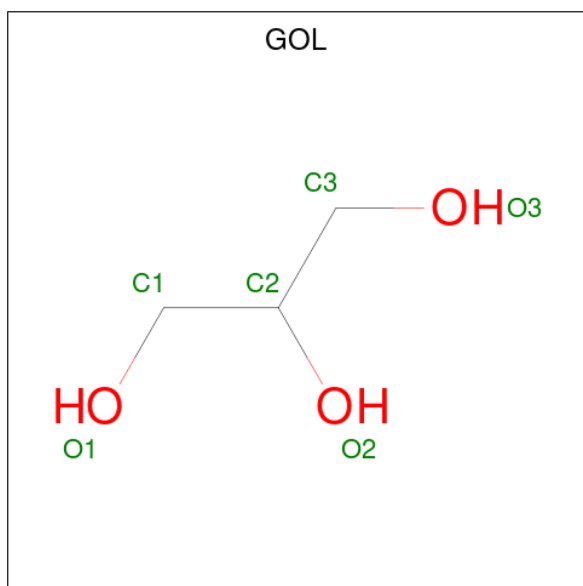
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
9	B	1	Total	C	N	0	0
			5	3	2		
9	B	1	Total	C	N	0	0
			5	3	2		
9	C	1	Total	C	N	0	0
			5	3	2		
9	E	1	Total	C	N	0	0
			5	3	2		
9	E	1	Total	C	N	0	0
			5	3	2		

- Molecule 10 is 2-(N-MORPHOLINO)-ETHANESULFONIC ACID (three-letter code: 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		
10	B	1	12	6	1	4	1	0	0

- Molecule 11 is GLYCEROL (three-letter code: GOL) (formula: C<sub>3</sub>H<sub>8</sub>O<sub>3</sub>).

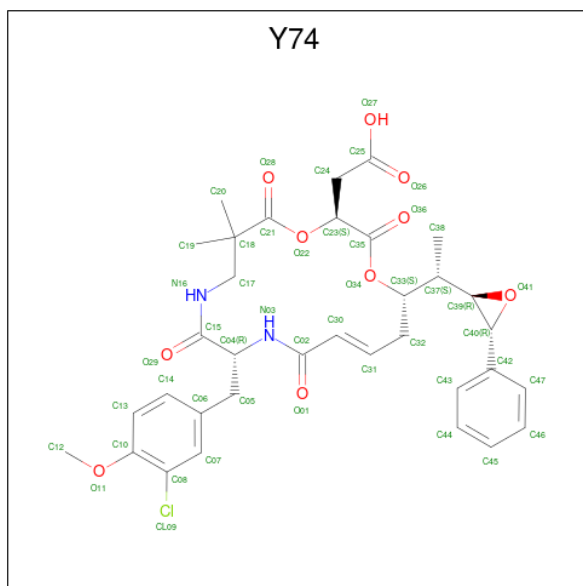


Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
			Total	C	O		
11	B	1	6	3	3	0	0

- Molecule 12 is 2-[(3 {S},10 {R},13 {E},16 {S})-10-[(3-chloranyl-4-methoxy-phenyl)methyl]-6,6-dimethyl-2,5,9,12-tetrakis(oxidanylidene)-16-[(1 {S})-1-[(2 {R},3 {R})-3-phenyloxiran-2-yl]ethyl]-1,4-dioxo-8,11-diazacyclohexadec-13-en-3-yl]ethanoic acid (three-letter code: Y74)

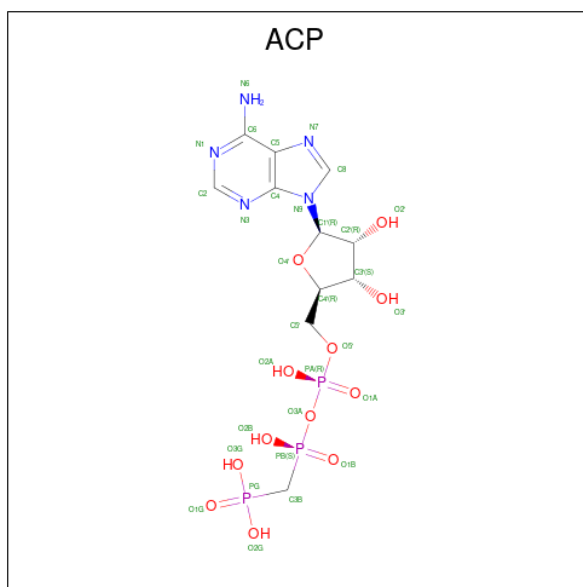


(formula:  $C_{34}H_{39}ClN_2O_{10}$ ) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	
12	D	1	Total	C	Cl	N	O	0	0
			47	34	1	2	10		
12	D	1	Total	C	Cl	N	O	0	0
			47	34	1	2	10		

- Molecule 13 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		
13	F	1	31	11	5	12	3	0	0

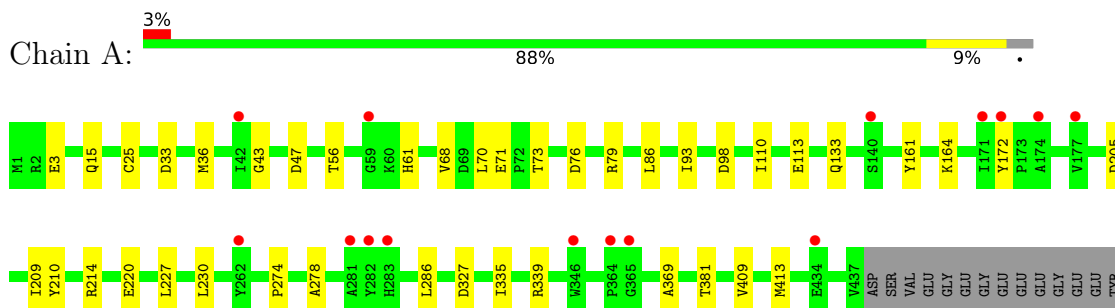
- Molecule 14 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
14	A	105	Total 105	O 105	0	0
14	B	109	Total 109	O 109	0	0
14	C	230	Total 230	O 230	0	0
14	D	61	Total 61	O 61	0	0
14	E	24	Total 24	O 24	0	0
14	F	25	Total 25	O 25	0	0

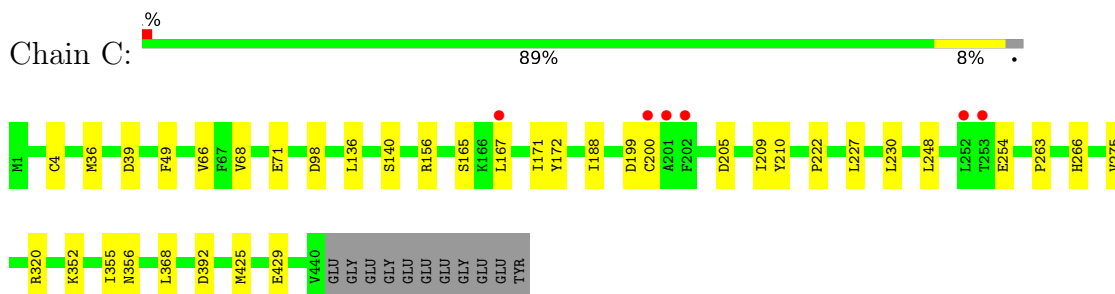
### 3 Residue-property plots [i](#)

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.

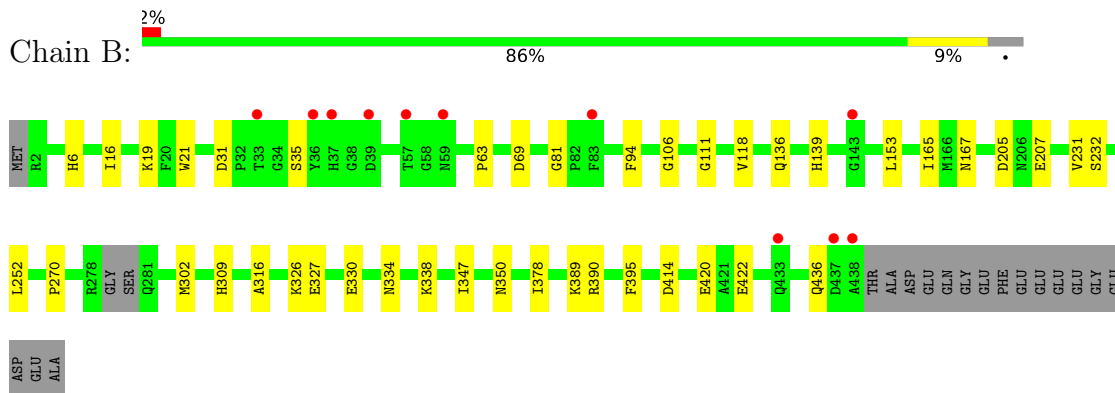
- Molecule 1: Detyrosinated tubulin alpha-1B chain



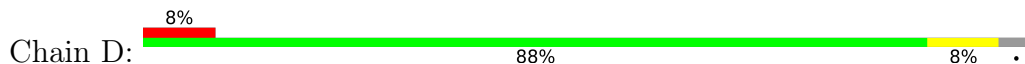
- Molecule 1: Detyrosinated tubulin alpha-1B chain

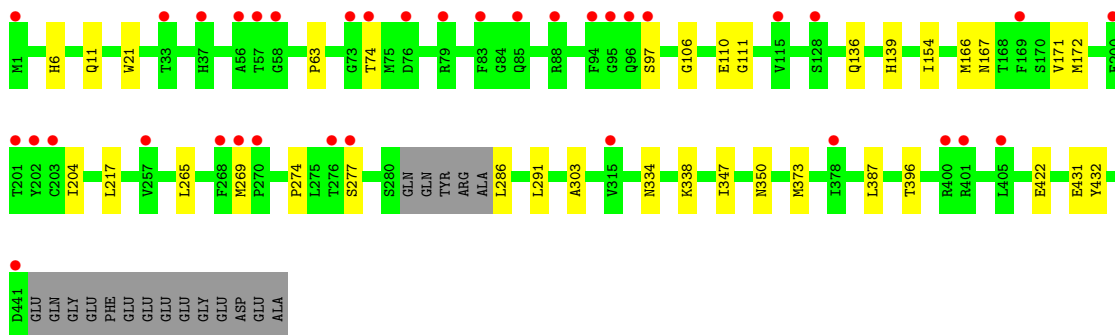


- Molecule 2: Tubulin beta-2B chain

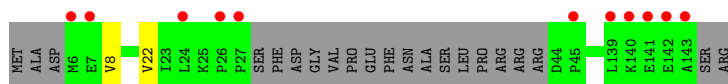
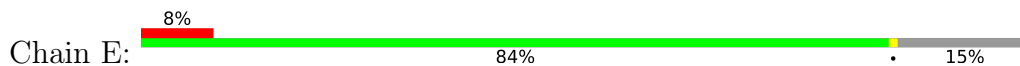


- Molecule 2: Tubulin beta-2B chain

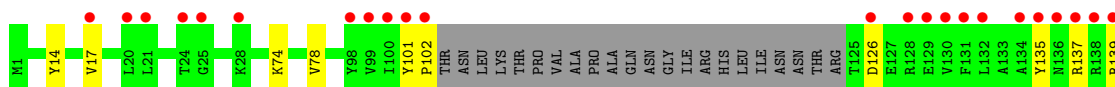
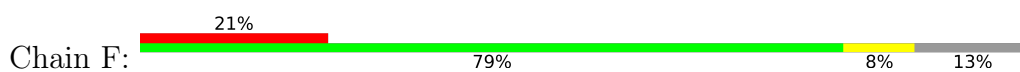




• Molecule 3: Stathmin-4



• 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, $\alpha$ , $\beta$ , $\gamma$	104.75Å 158.66Å 180.28Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	49.52 – 2.20 49.52 – 2.20	Depositor EDS
% Data completeness (in resolution range)	99.8 (49.52-2.20) 99.8 (49.52-2.20)	Depositor EDS
$R_{merge}$	0.09	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.18 (at 2.20Å)	Xtrriage
Refinement program	PHENIX 1.20_4459	Depositor
R, $R_{free}$	0.194 , 0.229 0.192 , 0.227	Depositor DCC
$R_{free}$ test set	7621 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	53.0	Xtrriage
Anisotropy	0.341	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.32 , 50.9	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	0.96	EDS
Total number of atoms	18309	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	71.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.40% 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: CA, GDP, ACP, Y74, GOL, GTP, MES, MG, IMD

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	0.25	0/3550	0.48	0/4819
1	C	0.27	0/3577	0.49	0/4858
2	B	0.26	0/3448	0.48	0/4670
2	D	0.25	0/3424	0.47	0/4636
3	E	0.24	0/1041	0.42	0/1381
4	F	0.24	0/2839	0.46	0/3833
All	All	0.25	0/17879	0.47	0/24197

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	3463	0	3380	24	0
1	C	3482	0	3396	20	0
2	B	3368	0	3236	24	0
2	D	3348	0	3231	19	0
3	E	1027	0	1046	1	0
4	F	2770	0	2744	18	0
5	A	32	0	12	2	0

*Continued on next page...*

Continued from previous page...

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
5	C	32	0	12	0	0
6	A	1	0	0	0	0
6	B	1	0	0	0	0
6	C	1	0	0	0	0
6	D	1	0	0	0	0
6	F	1	0	0	0	0
7	A	2	0	0	0	0
7	B	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	10	0	10	2	0
9	C	5	0	5	0	0
9	E	10	0	10	0	0
10	B	12	0	12	0	0
11	B	6	0	8	0	0
12	D	94	0	0	0	0
13	F	31	0	14	0	0
14	A	105	0	0	2	0
14	B	109	0	0	2	0
14	C	230	0	0	1	0
14	D	61	0	0	1	0
14	E	24	0	0	0	0
14	F	25	0	0	0	0
All	All	18309	0	17140	105	0

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

The worst 5 of 105 close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:414[B]:ASP:OD2	14:B:601:HOH:O	2.10	0.69
4:F:200:ASP:OD2	4:F:222:ARG:NH2	2.26	0.67
2:D:269:MET:HG3	2:D:303:ALA:HB3	1.80	0.62
4:F:197:ARG:NH1	4:F:257:GLU:OE2	2.25	0.60
2:B:19:LYS:HE2	9:B:503:IMD:H4	1.83	0.60

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	442/451 (98%)	432 (98%)	10 (2%)	0	100	100
1	C	446/451 (99%)	438 (98%)	8 (2%)	0	100	100
2	B	425/445 (96%)	419 (99%)	6 (1%)	0	100	100
2	D	423/445 (95%)	415 (98%)	8 (2%)	0	100	100
3	E	121/143 (85%)	121 (100%)	0	0	100	100
4	F	327/384 (85%)	315 (96%)	12 (4%)	0	100	100
All	All	2184/2319 (94%)	2140 (98%)	44 (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	375/379 (99%)	372 (99%)	3 (1%)	81	90
1	C	379/379 (100%)	379 (100%)	0	100	100
2	B	371/383 (97%)	369 (100%)	2 (0%)	88	94
2	D	369/383 (96%)	368 (100%)	1 (0%)	92	97
3	E	112/127 (88%)	112 (100%)	0	100	100
4	F	306/342 (90%)	304 (99%)	2 (1%)	84	91
All	All	1912/1993 (96%)	1904 (100%)	8 (0%)	91	96

5 of 8 residues with a non-rotameric sidechain are listed below:



Mol	Chain	Res	Type
4	F	343	TYR
4	F	137	ARG
2	B	232	SER
2	B	139	HIS
2	D	139	HIS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such sidechains are listed below:

Mol	Chain	Res	Type
4	F	348	GLN

### 5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

### 5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

### 5.6 Ligand geometry [i](#)

Of 23 ligands modelled in this entry, 9 are monoatomic - leaving 14 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	IMD	E	202	-	3,5,5	0.42	0	4,5,5	0.59	0
11	GOL	B	506	-	5,5,5	0.89	0	5,5,5	0.94	0
9	IMD	E	201	-	3,5,5	0.42	0	4,5,5	0.58	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
12	Y74	D	504	-	49,50,50	0.96	2 (4%)	61,71,71	1.30	6 (9%)
9	IMD	B	503	-	3,5,5	0.41	0	4,5,5	0.62	0
8	GDP	B	501	6	24,30,30	0.95	1 (4%)	30,47,47	1.08	4 (13%)
5	GTP	C	501	6	26,34,34	1.13	2 (7%)	32,54,54	1.38	5 (15%)
10	MES	B	505	-	12,12,12	2.19	1 (8%)	14,16,16	1.88	3 (21%)
12	Y74	D	503	-	49,50,50	0.95	2 (4%)	61,71,71	1.27	5 (8%)
9	IMD	B	504	-	3,5,5	0.41	0	4,5,5	0.59	0
5	GTP	A	501	6	26,34,34	1.12	2 (7%)	32,54,54	1.37	5 (15%)
13	ACP	F	402	6	27,33,33	1.97	7 (25%)	32,52,52	1.29	4 (12%)
9	IMD	C	504	-	3,5,5	0.42	0	4,5,5	0.55	0
8	GDP	D	501	6	24,30,30	0.94	1 (4%)	30,47,47	1.08	4 (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. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
9	IMD	E	202	-	-	-	0/1/1/1
9	IMD	E	201	-	-	-	0/1/1/1
12	Y74	D	504	-	-	5/60/65/65	0/3/4/4
8	GDP	B	501	6	-	4/12/32/32	0/3/3/3
5	GTP	C	501	6	-	8/18/38/38	0/3/3/3
12	Y74	D	503	-	-	2/60/65/65	0/3/4/4
10	MES	B	505	-	-	5/6/14/14	0/1/1/1
9	IMD	B	503	-	-	-	0/1/1/1
9	IMD	B	504	-	-	-	0/1/1/1
9	IMD	C	504	-	-	-	0/1/1/1
5	GTP	A	501	6	-	8/18/38/38	0/3/3/3
13	ACP	F	402	6	-	7/15/38/38	0/3/3/3
11	GOL	B	506	-	-	0/4/4/4	-
8	GDP	D	501	6	-	4/12/32/32	0/3/3/3

The worst 5 of 18 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
10	B	505	MES	C8-S	-7.32	1.67	1.77
13	F	402	ACP	PG-O1G	5.36	1.61	1.50
13	F	402	ACP	PB-O1B	4.11	1.61	1.51

Continued on next page...

*Continued from previous page...*

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	C	501	GTP	C5-C6	-4.04	1.39	1.47
5	A	501	GTP	C5-C6	-4.03	1.39	1.47

The worst 5 of 36 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
10	B	505	MES	C5-N4-C3	4.90	119.87	108.83
12	D	503	Y74	C23-O22-C21	4.19	121.79	116.88
12	D	504	Y74	C39-O41-C40	4.15	63.77	60.78
12	D	503	Y74	C39-O41-C40	4.02	63.67	60.78
12	D	504	Y74	C18-C17-N16	-3.70	108.97	114.16

There are no chirality outliers.

5 of 43 torsion outliers are listed below:

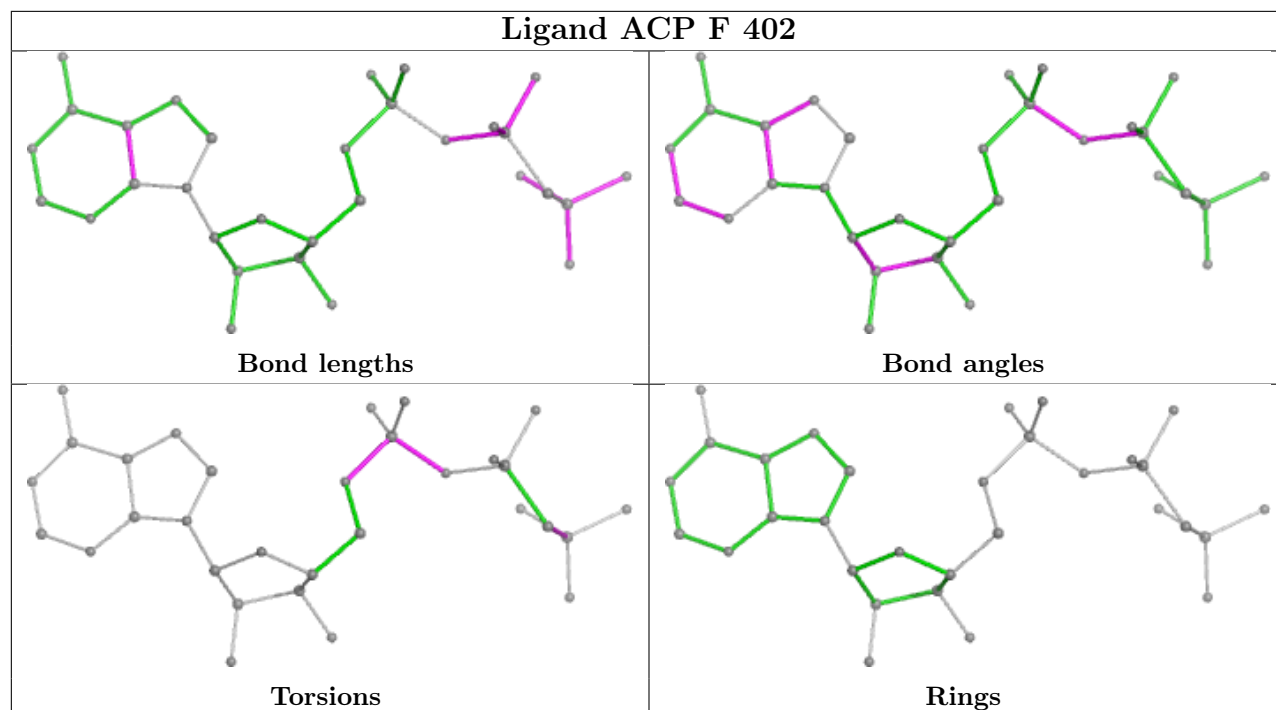
Mol	Chain	Res	Type	Atoms
5	A	501	GTP	PB-O3B-PG-O3G
5	A	501	GTP	C5'-O5'-PA-O1A
5	C	501	GTP	C5'-O5'-PA-O1A
5	C	501	GTP	C5'-O5'-PA-O2A
8	B	501	GDP	C5'-O5'-PA-O1A

There are no ring outliers.

2 monomers are involved in 4 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
9	B	503	IMD	2	0
5	A	501	GTP	2	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	437/451 (96%)	0.14	15 (3%) 45 43	46, 63, 91, 139	0
1	C	440/451 (97%)	0.05	6 (1%) 75 73	41, 52, 73, 112	0
2	B	425/445 (95%)	0.17	11 (2%) 56 53	41, 58, 89, 138	0
2	D	426/445 (95%)	0.34	36 (8%) 10 9	50, 71, 102, 142	0
3	E	122/143 (85%)	0.21	11 (9%) 9 8	49, 73, 115, 145	0
4	F	334/384 (86%)	1.03	79 (23%) 0 0	57, 96, 155, 168	0
All	All	2184/2319 (94%)	0.31	158 (7%) 15 14	41, 66, 120, 168	0

The worst 5 of 158 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	B	438	ALA	9.1
4	F	132	LEU	8.1
4	F	173	ILE	7.8
1	A	282	TYR	7.1
4	F	240	LEU	6.3

### 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](#)

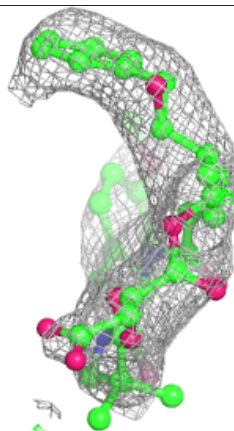
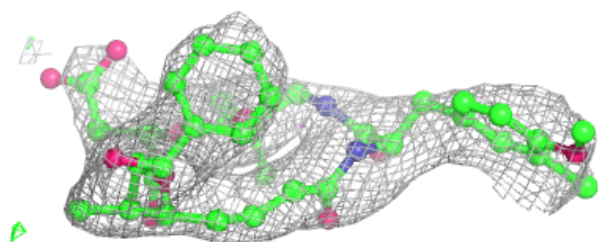
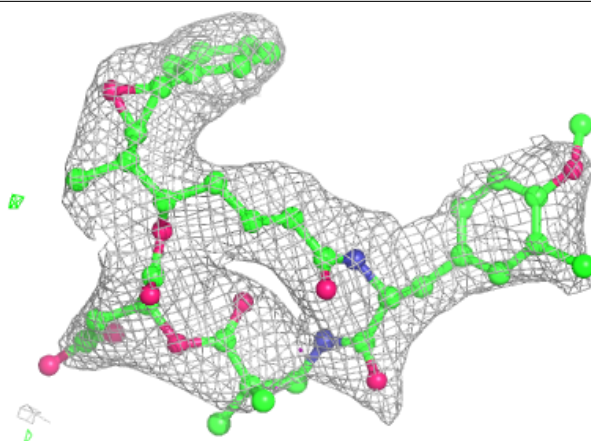
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95<sup>th</sup> percentile and maximum values of B factors of atoms in the group. The column labelled 'Q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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å <sup>2</sup> )	Q<0.9
9	IMD	B	504	5/5	0.81	0.16	87,94,97,108	0
9	IMD	E	202	5/5	0.84	0.23	108,110,117,118	0
9	IMD	B	503	5/5	0.85	0.23	88,89,93,101	0
11	GOL	B	506	6/6	0.85	0.26	74,80,82,82	0
12	Y74	D	503	47/47	0.85	0.34	75,97,114,130	0
9	IMD	E	201	5/5	0.90	0.12	98,101,101,108	0
9	IMD	C	504	5/5	0.90	0.12	81,82,84,88	0
13	ACP	F	402	31/31	0.90	0.13	104,117,129,134	0
12	Y74	D	504	47/47	0.92	0.19	74,87,114,119	0
6	MG	F	401	1/1	0.92	0.07	106,106,106,106	0
6	MG	A	502	1/1	0.93	0.15	47,47,47,47	0
7	CA	A	504	1/1	0.94	0.03	108,108,108,108	0
7	CA	B	507	1/1	0.95	0.09	112,112,112,112	0
6	MG	C	502	1/1	0.97	0.16	47,47,47,47	0
10	MES	B	505	12/12	0.97	0.11	53,62,70,79	0
8	GDP	D	501	28/28	0.97	0.10	63,70,78,86	0
7	CA	A	503	1/1	0.98	0.03	82,82,82,82	0
5	GTP	C	501	32/32	0.98	0.17	45,46,50,53	0
6	MG	D	502	1/1	0.98	0.06	72,72,72,72	0
8	GDP	B	501	28/28	0.98	0.20	39,45,50,56	0
5	GTP	A	501	32/32	0.98	0.20	45,47,53,57	0
6	MG	B	502	1/1	0.99	0.23	39,39,39,39	0
7	CA	C	503	1/1	0.99	0.08	64,64,64,64	0

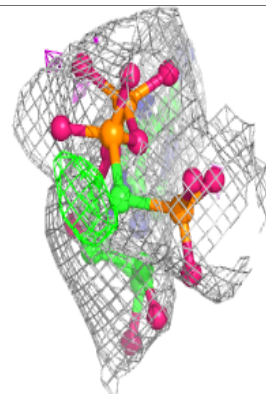
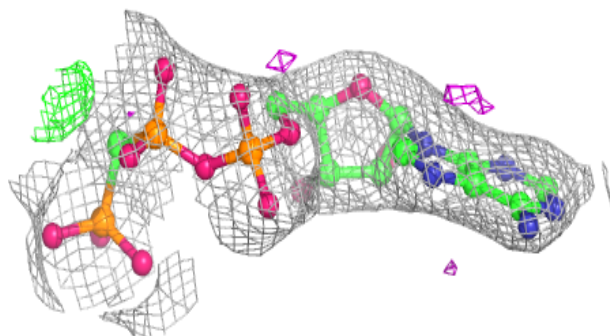
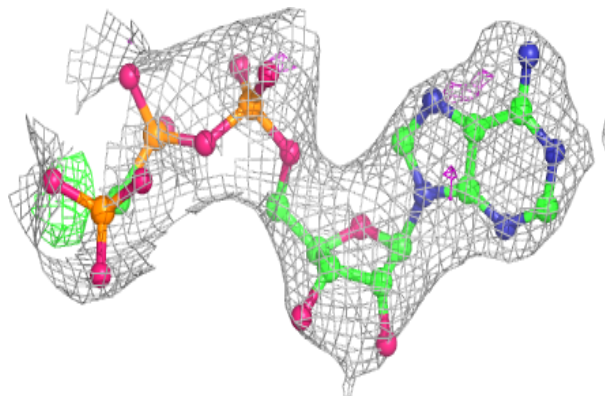
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.

**Electron density around Y74 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)

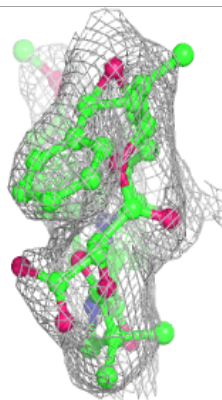
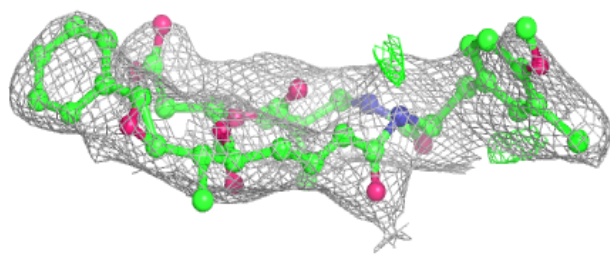
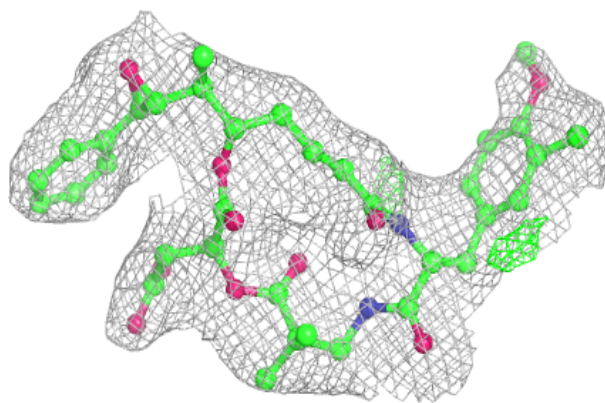
**Electron density around ACP F 402:**

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



**Electron density around Y74 D 504:**

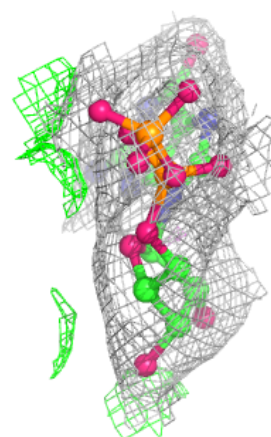
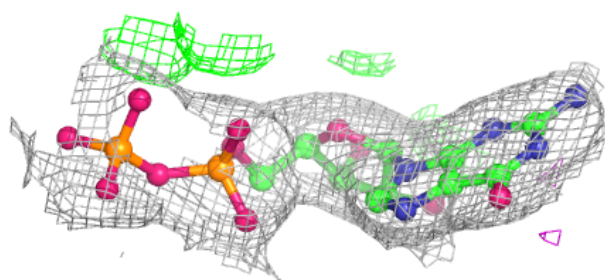
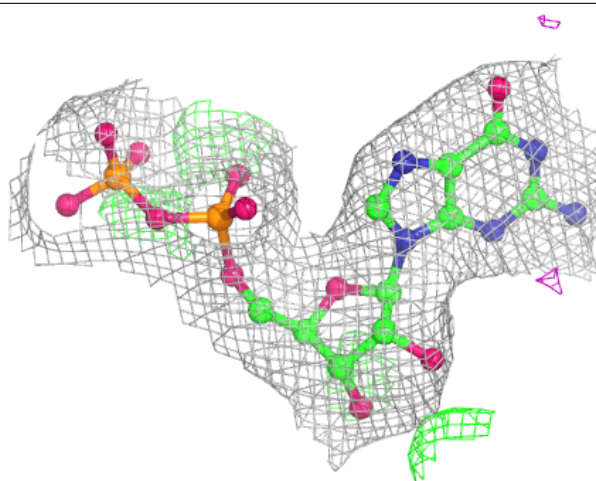
$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)

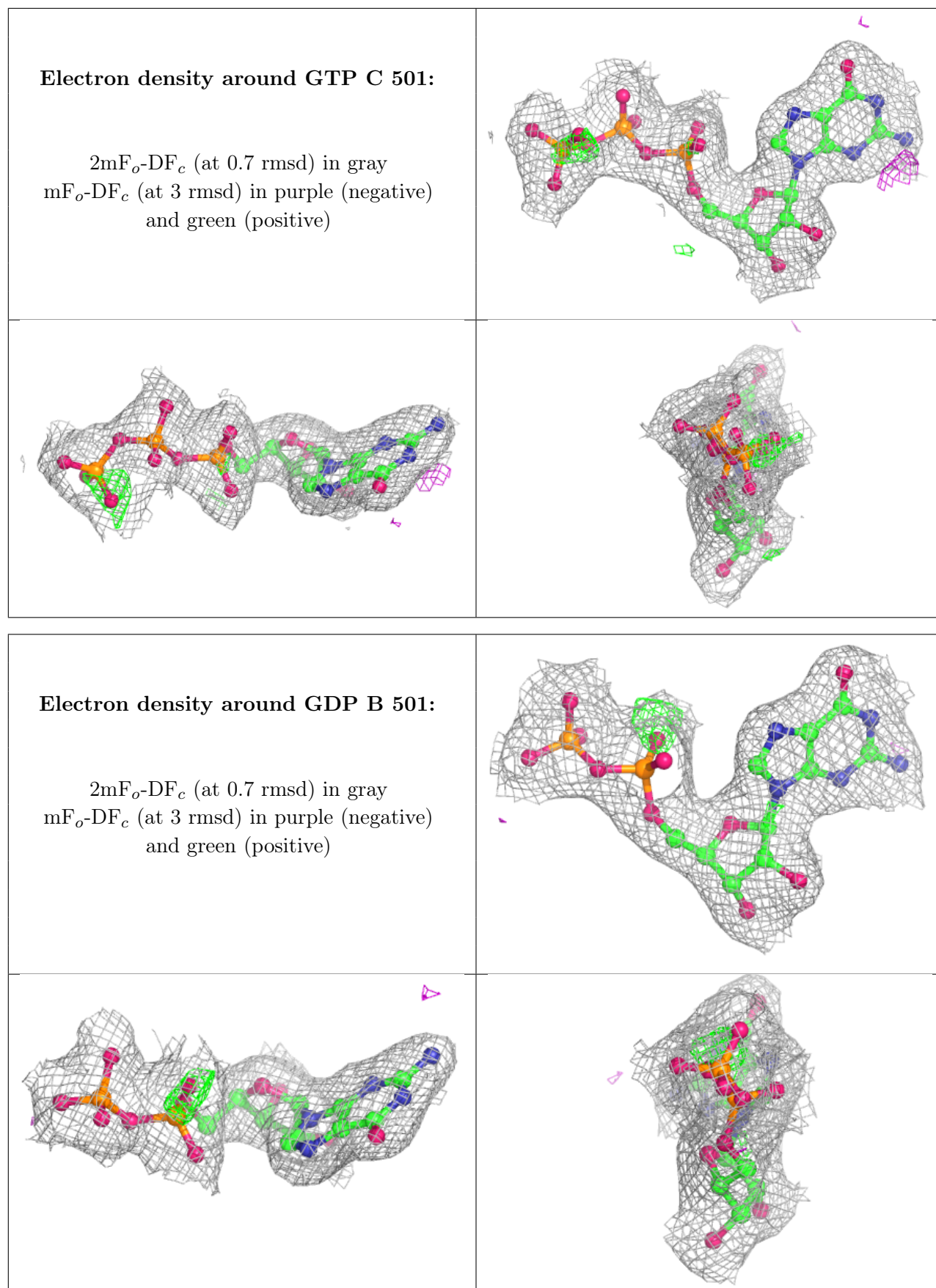


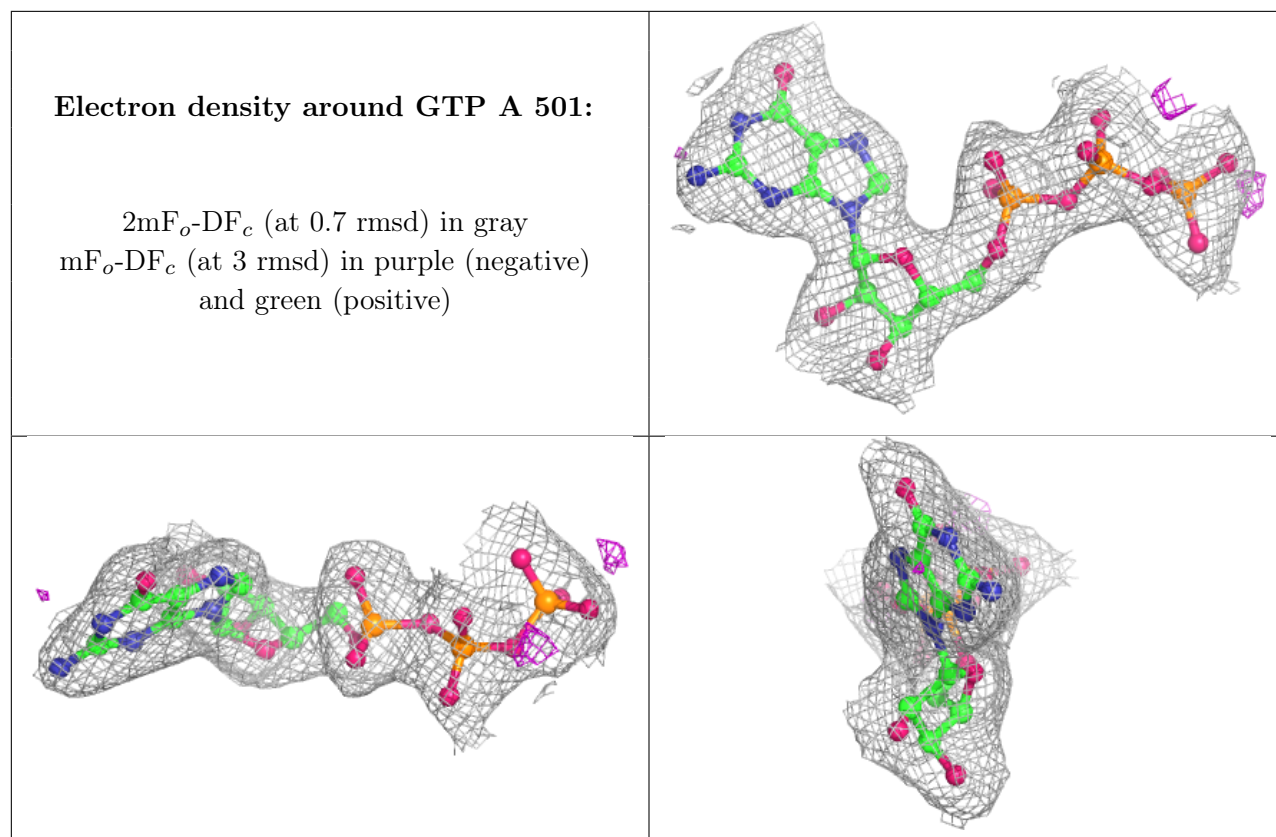


**Electron density around GDP D 501:**

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







## 6.5 Other polymers [i](#)

There are no such residues in this entry.