



# wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 19, 2026 – 04:14 PM JST

PDB ID : 9XAX / pdb\_00009xax  
Title : Crystal structure of L-threonate 3-dehydrogenase from *Paracoccus litorisediminis* (NADP<sup>+</sup> and tartronate bound form)  
Authors : Watanabe, S.; Sato, H.  
Deposited on : 2025-10-23  
Resolution : 2.08 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>.

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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 : 1.8.5 (274361), CSD as541be (2020)  
Xtrriage (Phenix) : 2.0  
EDS : 3.0  
buster-report : 1.1.7 (2018)  
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)  
CCP4 : 9.0.010 (Gargrove)  
Density-Fitness : 1.0.12  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.48.1

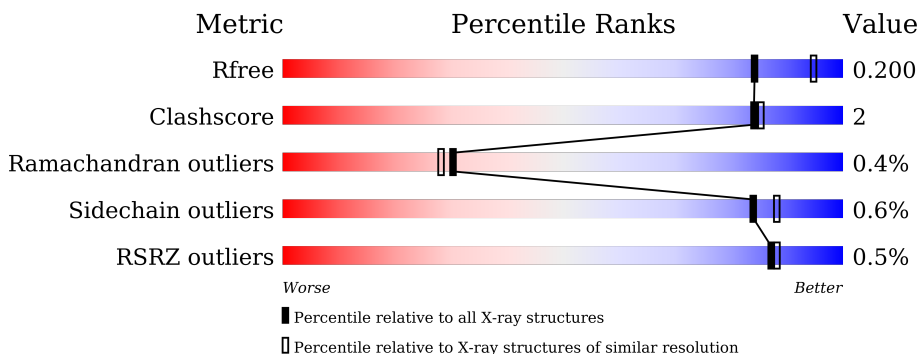
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.08 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
$R_{free}$	164625	7574 (2.10-2.06)
Clashscore	180529	8325 (2.10-2.06)
Ramachandran outliers	177936	8271 (2.10-2.06)
Sidechain outliers	177891	8272 (2.10-2.06)
RSRZ outliers	164620	7574 (2.10-2.06)

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	255	
1	B	255	
1	C	255	
1	D	255	
1	E	255	
1	F	255	

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Mol	Chain	Length	Quality of chain
1	G	255	 87% 5% 7%
1	H	255	 % 89% 7%
1	I	255	 89% 8%
1	J	255	 87% 8%
1	K	255	 2% 87% 8%
1	L	255	 93% 5%

## 2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 23163 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 SDR family NAD(P)-dependent oxidoreductase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	234	1720	1074	313	323	10	0	0	0
1	B	234	1740	1082	315	333	10	0	0	0
1	C	235	1735	1081	312	332	10	0	0	0
1	D	234	1723	1073	315	325	10	0	0	0
1	E	235	1739	1081	315	333	10	0	0	0
1	F	243	1784	1111	318	343	12	0	0	0
1	G	237	1762	1095	319	338	10	0	0	0
1	H	236	1752	1091	315	336	10	0	0	0
1	I	234	1716	1068	307	331	10	0	0	0
1	J	234	1717	1069	309	329	10	0	0	0
1	K	234	1718	1071	310	327	10	0	0	0
1	L	243	1786	1112	322	340	12	0	0	0

There are 144 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-10	MET	-	initiating methionine	UNP A0A844HLS7
A	-9	ARG	-	expression tag	UNP A0A844HLS7
A	-8	GLY	-	expression tag	UNP A0A844HLS7
A	-7	SER	-	expression tag	UNP A0A844HLS7
A	-6	HIS	-	expression tag	UNP A0A844HLS7

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Chain	Residue	Modelled	Actual	Comment	Reference
A	-5	HIS	-	expression tag	UNP A0A844HLS7
A	-4	HIS	-	expression tag	UNP A0A844HLS7
A	-3	HIS	-	expression tag	UNP A0A844HLS7
A	-2	HIS	-	expression tag	UNP A0A844HLS7
A	-1	HIS	-	expression tag	UNP A0A844HLS7
A	0	GLY	-	expression tag	UNP A0A844HLS7
A	1	SER	-	expression tag	UNP A0A844HLS7
B	-10	MET	-	initiating methionine	UNP A0A844HLS7
B	-9	ARG	-	expression tag	UNP A0A844HLS7
B	-8	GLY	-	expression tag	UNP A0A844HLS7
B	-7	SER	-	expression tag	UNP A0A844HLS7
B	-6	HIS	-	expression tag	UNP A0A844HLS7
B	-5	HIS	-	expression tag	UNP A0A844HLS7
B	-4	HIS	-	expression tag	UNP A0A844HLS7
B	-3	HIS	-	expression tag	UNP A0A844HLS7
B	-2	HIS	-	expression tag	UNP A0A844HLS7
B	-1	HIS	-	expression tag	UNP A0A844HLS7
B	0	GLY	-	expression tag	UNP A0A844HLS7
B	1	SER	-	expression tag	UNP A0A844HLS7
C	-10	MET	-	initiating methionine	UNP A0A844HLS7
C	-9	ARG	-	expression tag	UNP A0A844HLS7
C	-8	GLY	-	expression tag	UNP A0A844HLS7
C	-7	SER	-	expression tag	UNP A0A844HLS7
C	-6	HIS	-	expression tag	UNP A0A844HLS7
C	-5	HIS	-	expression tag	UNP A0A844HLS7
C	-4	HIS	-	expression tag	UNP A0A844HLS7
C	-3	HIS	-	expression tag	UNP A0A844HLS7
C	-2	HIS	-	expression tag	UNP A0A844HLS7
C	-1	HIS	-	expression tag	UNP A0A844HLS7
C	0	GLY	-	expression tag	UNP A0A844HLS7
C	1	SER	-	expression tag	UNP A0A844HLS7
D	-10	MET	-	initiating methionine	UNP A0A844HLS7
D	-9	ARG	-	expression tag	UNP A0A844HLS7
D	-8	GLY	-	expression tag	UNP A0A844HLS7
D	-7	SER	-	expression tag	UNP A0A844HLS7
D	-6	HIS	-	expression tag	UNP A0A844HLS7
D	-5	HIS	-	expression tag	UNP A0A844HLS7
D	-4	HIS	-	expression tag	UNP A0A844HLS7
D	-3	HIS	-	expression tag	UNP A0A844HLS7
D	-2	HIS	-	expression tag	UNP A0A844HLS7
D	-1	HIS	-	expression tag	UNP A0A844HLS7
D	0	GLY	-	expression tag	UNP A0A844HLS7

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Chain	Residue	Modelled	Actual	Comment	Reference
D	1	SER	-	expression tag	UNP A0A844HLS7
E	-10	MET	-	initiating methionine	UNP A0A844HLS7
E	-9	ARG	-	expression tag	UNP A0A844HLS7
E	-8	GLY	-	expression tag	UNP A0A844HLS7
E	-7	SER	-	expression tag	UNP A0A844HLS7
E	-6	HIS	-	expression tag	UNP A0A844HLS7
E	-5	HIS	-	expression tag	UNP A0A844HLS7
E	-4	HIS	-	expression tag	UNP A0A844HLS7
E	-3	HIS	-	expression tag	UNP A0A844HLS7
E	-2	HIS	-	expression tag	UNP A0A844HLS7
E	-1	HIS	-	expression tag	UNP A0A844HLS7
E	0	GLY	-	expression tag	UNP A0A844HLS7
E	1	SER	-	expression tag	UNP A0A844HLS7
F	-10	MET	-	initiating methionine	UNP A0A844HLS7
F	-9	ARG	-	expression tag	UNP A0A844HLS7
F	-8	GLY	-	expression tag	UNP A0A844HLS7
F	-7	SER	-	expression tag	UNP A0A844HLS7
F	-6	HIS	-	expression tag	UNP A0A844HLS7
F	-5	HIS	-	expression tag	UNP A0A844HLS7
F	-4	HIS	-	expression tag	UNP A0A844HLS7
F	-3	HIS	-	expression tag	UNP A0A844HLS7
F	-2	HIS	-	expression tag	UNP A0A844HLS7
F	-1	HIS	-	expression tag	UNP A0A844HLS7
F	0	GLY	-	expression tag	UNP A0A844HLS7
F	1	SER	-	expression tag	UNP A0A844HLS7
G	-10	MET	-	initiating methionine	UNP A0A844HLS7
G	-9	ARG	-	expression tag	UNP A0A844HLS7
G	-8	GLY	-	expression tag	UNP A0A844HLS7
G	-7	SER	-	expression tag	UNP A0A844HLS7
G	-6	HIS	-	expression tag	UNP A0A844HLS7
G	-5	HIS	-	expression tag	UNP A0A844HLS7
G	-4	HIS	-	expression tag	UNP A0A844HLS7
G	-3	HIS	-	expression tag	UNP A0A844HLS7
G	-2	HIS	-	expression tag	UNP A0A844HLS7
G	-1	HIS	-	expression tag	UNP A0A844HLS7
G	0	GLY	-	expression tag	UNP A0A844HLS7
G	1	SER	-	expression tag	UNP A0A844HLS7
H	-10	MET	-	initiating methionine	UNP A0A844HLS7
H	-9	ARG	-	expression tag	UNP A0A844HLS7
H	-8	GLY	-	expression tag	UNP A0A844HLS7
H	-7	SER	-	expression tag	UNP A0A844HLS7
H	-6	HIS	-	expression tag	UNP A0A844HLS7

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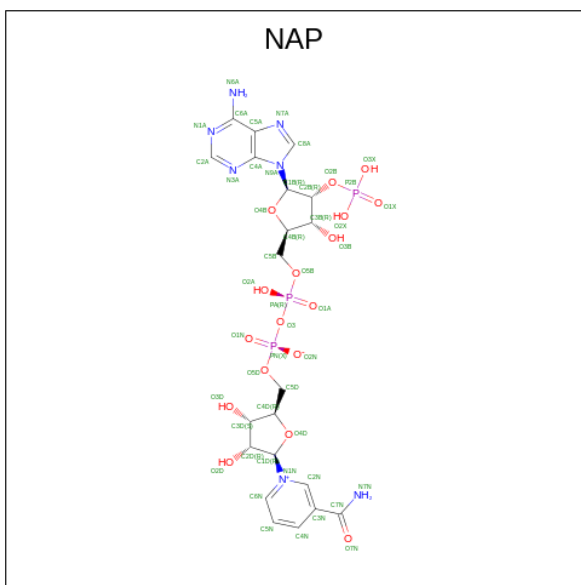
Chain	Residue	Modelled	Actual	Comment	Reference
H	-5	HIS	-	expression tag	UNP A0A844HLS7
H	-4	HIS	-	expression tag	UNP A0A844HLS7
H	-3	HIS	-	expression tag	UNP A0A844HLS7
H	-2	HIS	-	expression tag	UNP A0A844HLS7
H	-1	HIS	-	expression tag	UNP A0A844HLS7
H	0	GLY	-	expression tag	UNP A0A844HLS7
H	1	SER	-	expression tag	UNP A0A844HLS7
I	-10	MET	-	initiating methionine	UNP A0A844HLS7
I	-9	ARG	-	expression tag	UNP A0A844HLS7
I	-8	GLY	-	expression tag	UNP A0A844HLS7
I	-7	SER	-	expression tag	UNP A0A844HLS7
I	-6	HIS	-	expression tag	UNP A0A844HLS7
I	-5	HIS	-	expression tag	UNP A0A844HLS7
I	-4	HIS	-	expression tag	UNP A0A844HLS7
I	-3	HIS	-	expression tag	UNP A0A844HLS7
I	-2	HIS	-	expression tag	UNP A0A844HLS7
I	-1	HIS	-	expression tag	UNP A0A844HLS7
I	0	GLY	-	expression tag	UNP A0A844HLS7
I	1	SER	-	expression tag	UNP A0A844HLS7
J	-10	MET	-	initiating methionine	UNP A0A844HLS7
J	-9	ARG	-	expression tag	UNP A0A844HLS7
J	-8	GLY	-	expression tag	UNP A0A844HLS7
J	-7	SER	-	expression tag	UNP A0A844HLS7
J	-6	HIS	-	expression tag	UNP A0A844HLS7
J	-5	HIS	-	expression tag	UNP A0A844HLS7
J	-4	HIS	-	expression tag	UNP A0A844HLS7
J	-3	HIS	-	expression tag	UNP A0A844HLS7
J	-2	HIS	-	expression tag	UNP A0A844HLS7
J	-1	HIS	-	expression tag	UNP A0A844HLS7
J	0	GLY	-	expression tag	UNP A0A844HLS7
J	1	SER	-	expression tag	UNP A0A844HLS7
K	-10	MET	-	initiating methionine	UNP A0A844HLS7
K	-9	ARG	-	expression tag	UNP A0A844HLS7
K	-8	GLY	-	expression tag	UNP A0A844HLS7
K	-7	SER	-	expression tag	UNP A0A844HLS7
K	-6	HIS	-	expression tag	UNP A0A844HLS7
K	-5	HIS	-	expression tag	UNP A0A844HLS7
K	-4	HIS	-	expression tag	UNP A0A844HLS7
K	-3	HIS	-	expression tag	UNP A0A844HLS7
K	-2	HIS	-	expression tag	UNP A0A844HLS7
K	-1	HIS	-	expression tag	UNP A0A844HLS7
K	0	GLY	-	expression tag	UNP A0A844HLS7

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Chain	Residue	Modelled	Actual	Comment	Reference
K	1	SER	-	expression tag	UNP A0A844HLS7
L	-10	MET	-	initiating methionine	UNP A0A844HLS7
L	-9	ARG	-	expression tag	UNP A0A844HLS7
L	-8	GLY	-	expression tag	UNP A0A844HLS7
L	-7	SER	-	expression tag	UNP A0A844HLS7
L	-6	HIS	-	expression tag	UNP A0A844HLS7
L	-5	HIS	-	expression tag	UNP A0A844HLS7
L	-4	HIS	-	expression tag	UNP A0A844HLS7
L	-3	HIS	-	expression tag	UNP A0A844HLS7
L	-2	HIS	-	expression tag	UNP A0A844HLS7
L	-1	HIS	-	expression tag	UNP A0A844HLS7
L	0	GLY	-	expression tag	UNP A0A844HLS7
L	1	SER	-	expression tag	UNP A0A844HLS7

- Molecule 2 is NADP NICOTINAMIDE-ADENINE-DINUCLEOTIDE PHOSPHATE (CCD ID: NAP) (formula: C<sub>21</sub>H<sub>28</sub>N<sub>7</sub>O<sub>17</sub>P<sub>3</sub>) (labeled as "Ligand of Interest" by depositor).



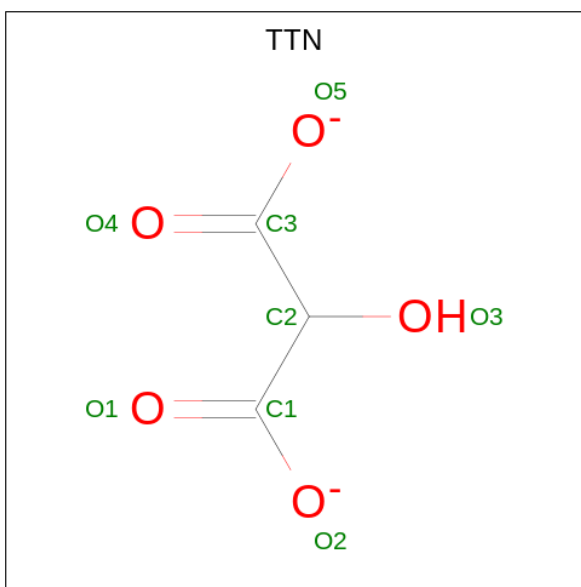
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf		
			Total	C	N	O			P	
2	A	1	Total	48	21	7	17	3	0	0
2	B	1	Total	48	21	7	17	3	0	0
2	C	1	Total	48	21	7	17	3	0	0
2	D	1	Total	48	21	7	17	3	0	0

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Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	E	1	Total	C	N	O	P	0	0
			48	21	7	17	3		
2	F	1	Total	C	N	O	P	0	0
			48	21	7	17	3		
2	G	1	Total	C	N	O	P	0	0
			48	21	7	17	3		
2	H	1	Total	C	N	O	P	0	0
			48	21	7	17	3		
2	I	1	Total	C	N	O	P	0	0
			48	21	7	17	3		
2	J	1	Total	C	N	O	P	0	0
			48	21	7	17	3		
2	K	1	Total	C	N	O	P	0	0
			48	21	7	17	3		
2	L	1	Total	C	N	O	P	0	0
			48	21	7	17	3		

- Molecule 3 is TARTRONATE (CCD ID: TTN) (formula:  $C_3H_2O_5$ ) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	C	O	0	0
			8	3	5		
3	B	1	Total	C	O	0	0
			8	3	5		
3	C	1	Total	C	O	0	0
			8	3	5		

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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	D	1	Total	C	O	0	0
			8	3	5		
3	E	1	Total	C	O	0	0
			8	3	5		
3	F	1	Total	C	O	0	0
			8	3	5		
3	G	1	Total	C	O	0	0
			8	3	5		
3	H	1	Total	C	O	0	0
			8	3	5		
3	I	1	Total	C	O	0	0
			8	3	5		
3	J	1	Total	C	O	0	0
			8	3	5		
3	K	1	Total	C	O	0	0
			8	3	5		
3	L	1	Total	C	O	0	0
			8	3	5		

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	151	Total	O	0	0
			151	151		
4	B	143	Total	O	0	0
			143	143		
4	C	148	Total	O	0	0
			148	148		
4	D	116	Total	O	0	0
			116	116		
4	E	111	Total	O	0	0
			111	111		
4	F	134	Total	O	0	0
			134	134		
4	G	138	Total	O	0	0
			138	138		
4	H	139	Total	O	0	0
			139	139		
4	I	131	Total	O	0	0
			131	131		
4	J	125	Total	O	0	0
			125	125		

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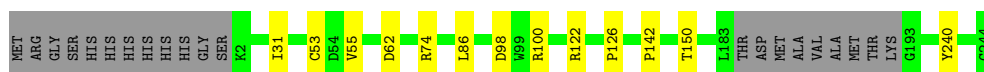
<b>Mol</b>	<b>Chain</b>	<b>Residues</b>	<b>Atoms</b>		<b>ZeroOcc</b>	<b>AltConf</b>
4	K	113	Total 113	O 113	0	0
4	L	150	Total 150	O 150	0	0

### 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: SDR family NAD(P)-dependent oxidoreductase

Chain A: 




- Molecule 1: SDR family NAD(P)-dependent oxidoreductase

Chain B: 




- Molecule 1: SDR family NAD(P)-dependent oxidoreductase

Chain C: 




- Molecule 1: SDR family NAD(P)-dependent oxidoreductase

Chain D: 




- Molecule 1: SDR family NAD(P)-dependent oxidoreductase

Chain E: 




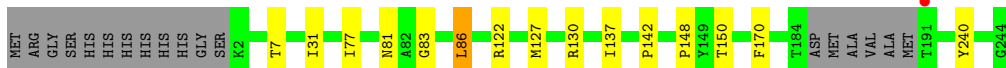
- Molecule 1: SDR family NAD(P)-dependent oxidoreductase

Chain F:  88% 7% 5%




- Molecule 1: SDR family NAD(P)-dependent oxidoreductase

Chain G:  87% 5% 7%




- Molecule 1: SDR family NAD(P)-dependent oxidoreductase

Chain H:  89% 7%




- Molecule 1: SDR family NAD(P)-dependent oxidoreductase

Chain I:  89% 8%




- Molecule 1: SDR family NAD(P)-dependent oxidoreductase

Chain J:  87% 8%



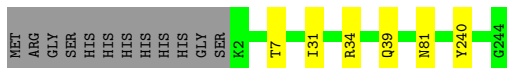
- Molecule 1: SDR family NAD(P)-dependent oxidoreductase

Chain K:  87% 2% 8%



- Molecule 1: SDR family NAD(P)-dependent oxidoreductase

Chain L:  93% 5%



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	69.36Å 72.55Å 140.25Å 85.28° 82.57° 84.52°	Depositor
Resolution (Å)	48.29 – 2.08 48.29 – 2.08	Depositor EDS
% Data completeness (in resolution range)	96.8 (48.29-2.08) 96.8 (48.29-2.08)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	9.03 (at 2.08Å)	Xtrriage
Refinement program	PHENIX (1.19.2_4158: ???)	Depositor
R, $R_{free}$	0.169 , 0.201 0.169 , 0.200	Depositor DCC
$R_{free}$ test set	8035 reflections (4.97%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	12.3	Xtrriage
Anisotropy	0.112	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.32 , 35.6	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.93	EDS
Total number of atoms	23163	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	13.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.15% 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: NAP, TTN

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	0.20	0/1750	0.42	0/2385
1	B	0.20	0/1770	0.41	0/2410
1	C	0.19	0/1765	0.41	0/2406
1	D	0.19	0/1753	0.40	0/2388
1	E	0.19	0/1769	0.40	0/2411
1	F	0.18	0/1815	0.40	0/2478
1	G	0.19	0/1792	0.42	0/2440
1	H	0.19	0/1782	0.40	0/2427
1	I	0.19	0/1746	0.38	0/2383
1	J	0.19	0/1747	0.39	0/2383
1	K	0.19	0/1748	0.40	0/2385
1	L	0.19	0/1817	0.41	0/2480
All	All	0.19	0/21254	0.40	0/28976

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	1720	0	1696	9	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	B	1740	0	1713	8	0
1	C	1735	0	1706	10	0
1	D	1723	0	1692	6	0
1	E	1739	0	1705	14	0
1	F	1784	0	1746	10	0
1	G	1762	0	1738	9	0
1	H	1752	0	1729	7	0
1	I	1716	0	1665	5	0
1	J	1717	0	1673	7	0
1	K	1718	0	1679	7	0
1	L	1786	0	1755	3	0
2	A	48	0	25	1	0
2	B	48	0	25	0	0
2	C	48	0	25	0	0
2	D	48	0	25	0	0
2	E	48	0	25	0	0
2	F	48	0	25	1	0
2	G	48	0	25	4	0
2	H	48	0	25	1	0
2	I	48	0	25	1	0
2	J	48	0	25	1	0
2	K	48	0	25	0	0
2	L	48	0	25	1	0
3	A	8	0	2	0	0
3	B	8	0	2	0	0
3	C	8	0	2	0	0
3	D	8	0	2	0	0
3	E	8	0	2	0	0
3	F	8	0	2	0	0
3	G	8	0	2	0	0
3	H	8	0	2	0	0
3	I	8	0	2	0	0
3	J	8	0	2	0	0
3	K	8	0	2	0	0
3	L	8	0	2	0	0
4	A	151	0	0	2	0
4	B	143	0	0	0	0
4	C	148	0	0	4	0
4	D	116	0	0	3	0
4	E	111	0	0	3	0
4	F	134	0	0	1	0
4	G	138	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
4	H	139	0	0	2	0
4	I	131	0	0	1	0
4	J	125	0	0	1	0
4	K	113	0	0	2	0
4	L	150	0	0	1	0
All	All	23163	0	20821	94	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.

The worst 5 of 94 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:E:119:ARG:NH1	4:E:402:HOH:O	2.21	0.74
1:I:183:LEU:O	4:I:401:HOH:O	2.07	0.72
1:D:119:ARG:NH1	4:D:403:HOH:O	2.24	0.70
1:H:2:LYS:N	4:H:402:HOH:O	2.26	0.68
1:B:20:ARG:NH1	1:B:214:ASP:OD1	2.26	0.68

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	230/255 (90%)	225 (98%)	4 (2%)	1 (0%)	30 28
1	B	230/255 (90%)	224 (97%)	5 (2%)	1 (0%)	30 28
1	C	231/255 (91%)	227 (98%)	3 (1%)	1 (0%)	30 28
1	D	230/255 (90%)	224 (97%)	5 (2%)	1 (0%)	30 28
1	E	231/255 (91%)	225 (97%)	5 (2%)	1 (0%)	30 28

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	F	241/255 (94%)	235 (98%)	5 (2%)	1 (0%)	30	28
1	G	233/255 (91%)	229 (98%)	3 (1%)	1 (0%)	30	28
1	H	232/255 (91%)	227 (98%)	4 (2%)	1 (0%)	30	28
1	I	230/255 (90%)	224 (97%)	5 (2%)	1 (0%)	30	28
1	J	230/255 (90%)	224 (97%)	5 (2%)	1 (0%)	30	28
1	K	230/255 (90%)	225 (98%)	4 (2%)	1 (0%)	30	28
1	L	241/255 (94%)	234 (97%)	6 (2%)	1 (0%)	30	28
All	All	2789/3060 (91%)	2723 (98%)	54 (2%)	12 (0%)	30	28

5 of 12 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	240	TYR
1	C	240	TYR
1	D	240	TYR
1	E	240	TYR
1	F	240	TYR

### 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	176/202 (87%)	176 (100%)	0	100	100
1	B	181/202 (90%)	180 (99%)	1 (1%)	84	88
1	C	180/202 (89%)	180 (100%)	0	100	100
1	D	176/202 (87%)	174 (99%)	2 (1%)	70	76
1	E	180/202 (89%)	180 (100%)	0	100	100
1	F	184/202 (91%)	182 (99%)	2 (1%)	70	76
1	G	184/202 (91%)	182 (99%)	2 (1%)	70	76
1	H	183/202 (91%)	183 (100%)	0	100	100
1	I	176/202 (87%)	175 (99%)	1 (1%)	84	88

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	J	176/202 (87%)	175 (99%)	1 (1%)	84	88
1	K	176/202 (87%)	173 (98%)	3 (2%)	56	62
1	L	184/202 (91%)	183 (100%)	1 (0%)	86	90
All	All	2156/2424 (89%)	2143 (99%)	13 (1%)	84	88

5 of 13 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	I	36	ASP
1	J	86	LEU
1	L	39	GLN
1	K	125	GLN
1	K	183	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 12 such sidechains are listed below:

Mol	Chain	Res	Type
1	H	227	ASN
1	H	237	ASN
1	L	47	ASN
1	J	227	ASN
1	B	237	ASN

### 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

24 ligands are modelled in this entry.

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
3	TTN	G	301	-	5,7,7	1.19	0	2,9,9	1.85	1 (50%)
2	NAP	E	302	-	45,52,52	4.61	18 (40%)	56,80,80	1.33	5 (8%)
3	TTN	L	302	-	5,7,7	1.20	0	2,9,9	1.64	0
2	NAP	B	301	-	45,52,52	4.60	19 (42%)	56,80,80	1.34	6 (10%)
2	NAP	L	301	-	45,52,52	4.55	18 (40%)	56,80,80	1.30	4 (7%)
3	TTN	C	301	-	5,7,7	1.26	0	2,9,9	1.61	0
3	TTN	D	301	-	5,7,7	1.26	0	2,9,9	1.65	0
3	TTN	H	302	-	5,7,7	1.24	0	2,9,9	1.44	0
3	TTN	K	302	-	5,7,7	1.19	0	2,9,9	1.90	1 (50%)
2	NAP	I	301	-	45,52,52	4.58	18 (40%)	56,80,80	1.28	5 (8%)
3	TTN	E	301	-	5,7,7	1.23	0	2,9,9	1.46	0
3	TTN	I	302	-	5,7,7	1.19	0	2,9,9	1.51	0
2	NAP	H	301	-	45,52,52	4.61	17 (37%)	56,80,80	1.28	6 (10%)
2	NAP	G	302	-	45,52,52	4.62	15 (33%)	56,80,80	1.46	8 (14%)
3	TTN	A	302	-	5,7,7	1.22	0	2,9,9	1.62	0
2	NAP	A	301	-	45,52,52	4.61	17 (37%)	56,80,80	1.31	6 (10%)
2	NAP	C	302	-	45,52,52	4.57	17 (37%)	56,80,80	1.28	4 (7%)
3	TTN	F	301	-	5,7,7	1.19	0	2,9,9	1.74	0
3	TTN	J	302	-	5,7,7	1.20	0	2,9,9	1.38	0
2	NAP	J	301	-	45,52,52	4.58	18 (40%)	56,80,80	1.34	6 (10%)
2	NAP	F	302	-	45,52,52	4.58	17 (37%)	56,80,80	1.30	4 (7%)
3	TTN	B	302	-	5,7,7	1.21	0	2,9,9	1.42	0
2	NAP	D	302	-	45,52,52	4.61	18 (40%)	56,80,80	1.29	6 (10%)
2	NAP	K	301	-	45,52,52	4.57	17 (37%)	56,80,80	1.26	4 (7%)

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
3	TTN	G	301	-	-	2/8/8/8	-
2	NAP	E	302	-	-	9/31/67/67	0/5/5/5
3	TTN	L	302	-	-	0/8/8/8	-
2	NAP	B	301	-	-	8/31/67/67	0/5/5/5
2	NAP	L	301	-	-	6/31/67/67	0/5/5/5
3	TTN	C	301	-	-	4/8/8/8	-
3	TTN	D	301	-	-	2/8/8/8	-
3	TTN	H	302	-	-	1/8/8/8	-
3	TTN	K	302	-	-	2/8/8/8	-
2	NAP	I	301	-	-	9/31/67/67	0/5/5/5
3	TTN	E	301	-	-	0/8/8/8	-
3	TTN	I	302	-	-	6/8/8/8	-
2	NAP	H	301	-	-	5/31/67/67	0/5/5/5
2	NAP	G	302	-	-	6/31/67/67	0/5/5/5
3	TTN	A	302	-	-	2/8/8/8	-
2	NAP	A	301	-	-	6/31/67/67	0/5/5/5
2	NAP	C	302	-	-	6/31/67/67	0/5/5/5
3	TTN	F	301	-	-	1/8/8/8	-
3	TTN	J	302	-	-	0/8/8/8	-
2	NAP	J	301	-	-	5/31/67/67	0/5/5/5
2	NAP	F	302	-	-	7/31/67/67	0/5/5/5
3	TTN	B	302	-	-	0/8/8/8	-
2	NAP	D	302	-	-	9/31/67/67	0/5/5/5
2	NAP	K	301	-	-	6/31/67/67	0/5/5/5

The worst 5 of 209 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	E	302	NAP	C2D-C1D	-18.07	1.26	1.53
2	H	301	NAP	C2D-C1D	-18.03	1.26	1.53
2	J	301	NAP	C2D-C1D	-17.94	1.26	1.53
2	A	301	NAP	C2D-C1D	-17.90	1.26	1.53
2	C	302	NAP	C2D-C1D	-17.81	1.26	1.53

The worst 5 of 66 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	G	302	NAP	N3A-C2A-N1A	-5.88	119.48	128.68
2	B	301	NAP	N3A-C2A-N1A	-5.74	119.71	128.68

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	D	302	NAP	N3A-C2A-N1A	-5.68	119.80	128.68
2	F	302	NAP	N3A-C2A-N1A	-5.67	119.81	128.68
2	L	301	NAP	N3A-C2A-N1A	-5.66	119.83	128.68

There are no chirality outliers.

5 of 102 torsion outliers are listed below:

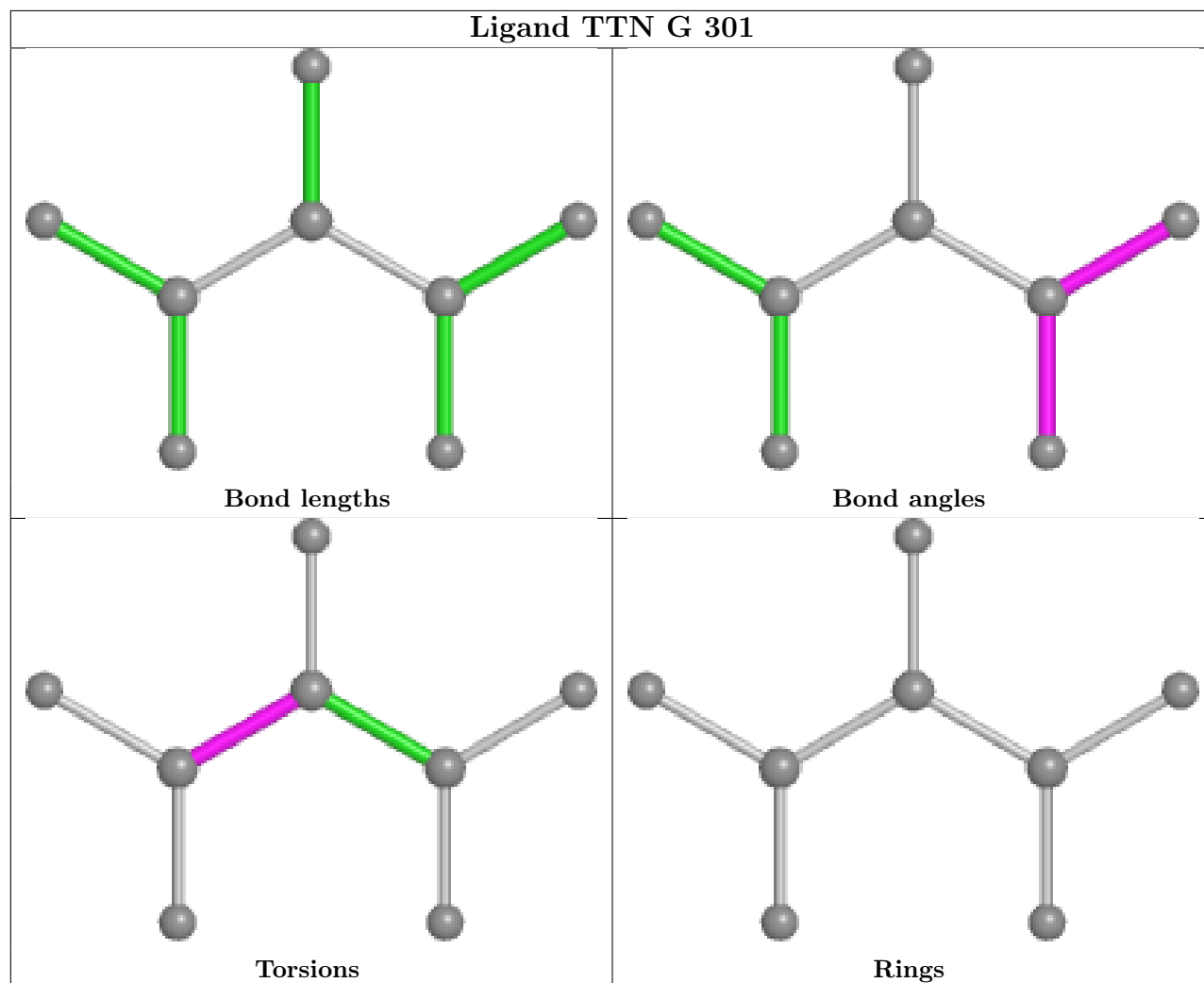
Mol	Chain	Res	Type	Atoms
2	A	301	NAP	C5D-O5D-PN-O3
2	B	301	NAP	C5D-O5D-PN-O3
2	B	301	NAP	C5D-O5D-PN-O2N
2	C	302	NAP	C5D-O5D-PN-O3
2	C	302	NAP	C5D-O5D-PN-O2N

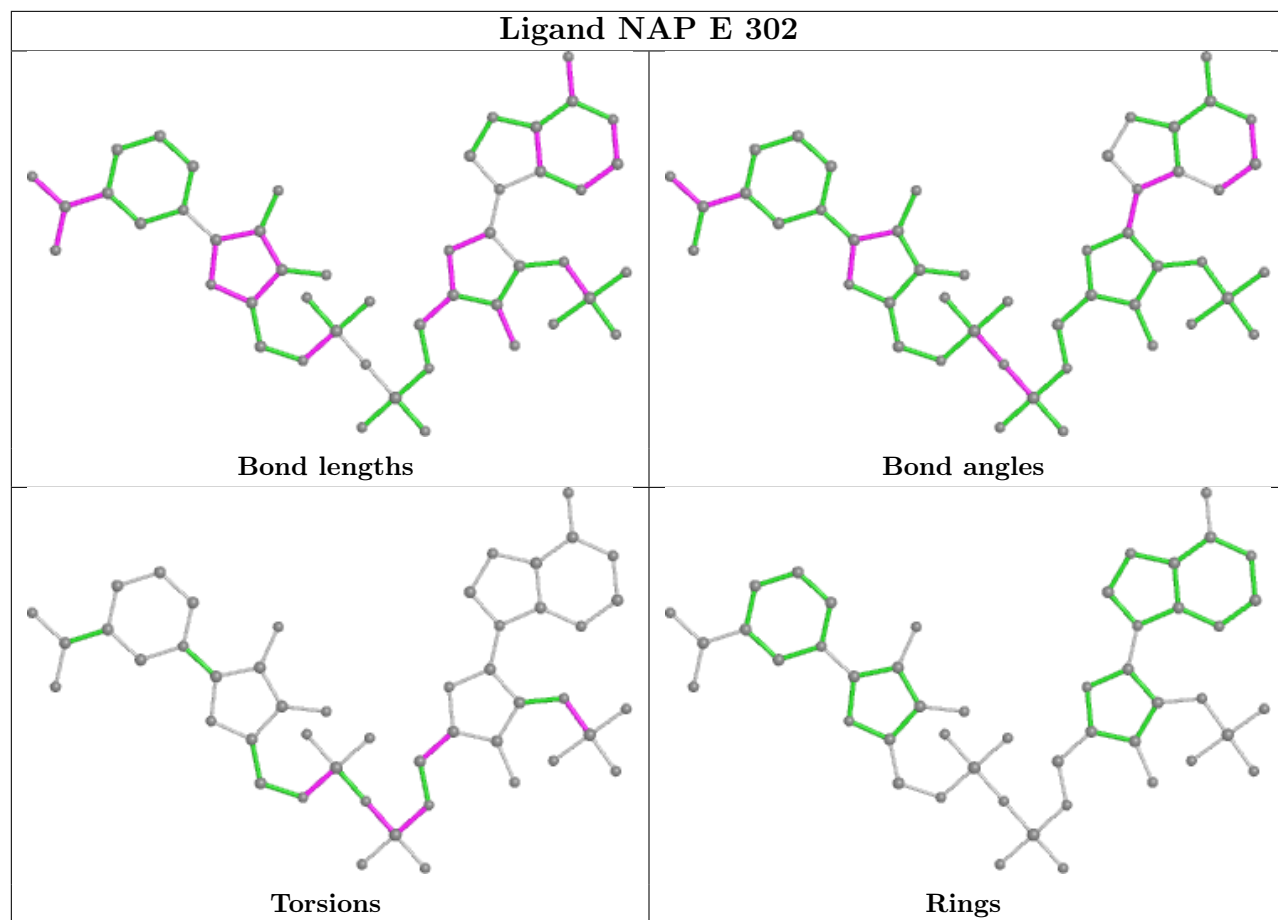
There are no ring outliers.

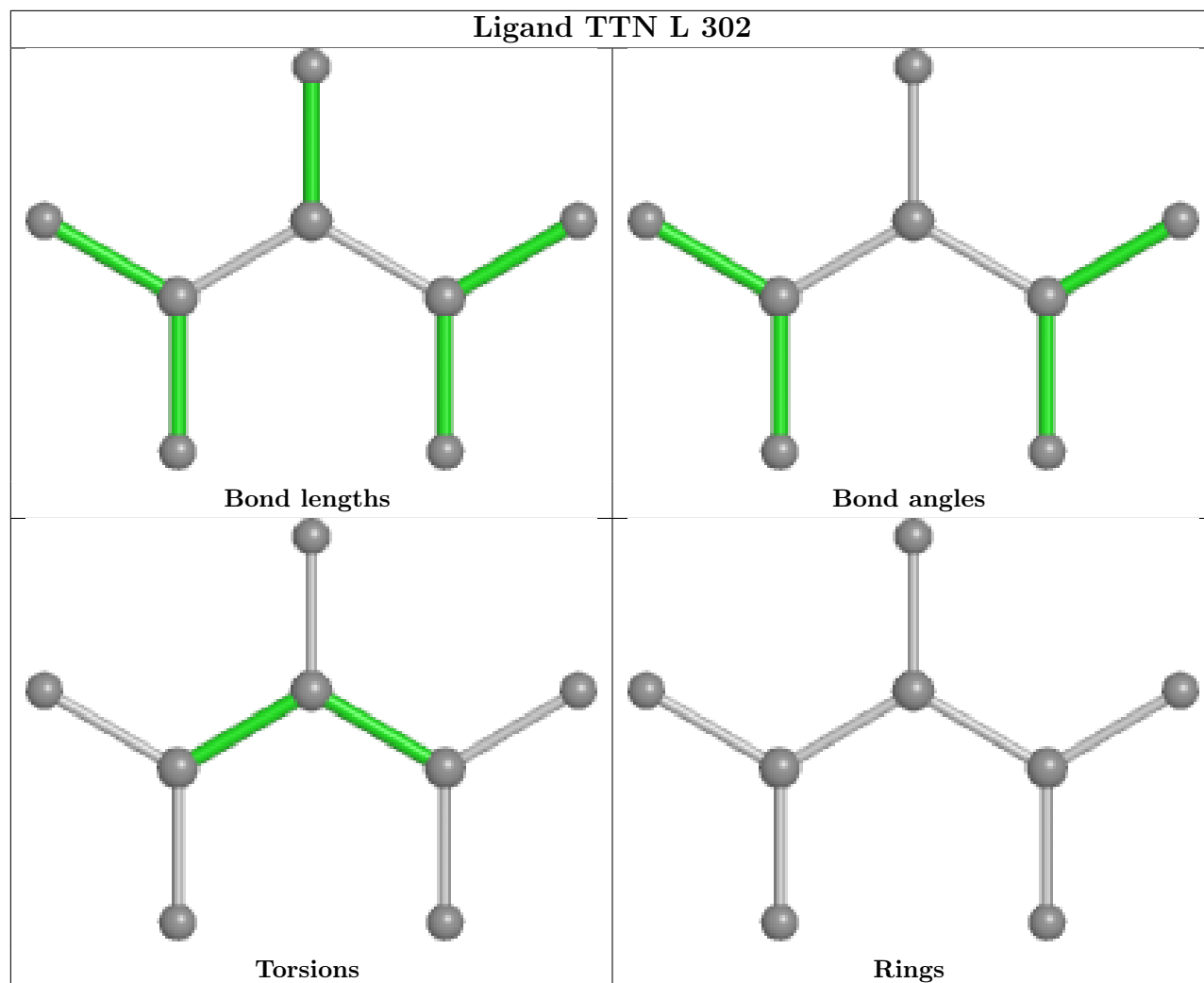
7 monomers are involved in 10 short contacts:

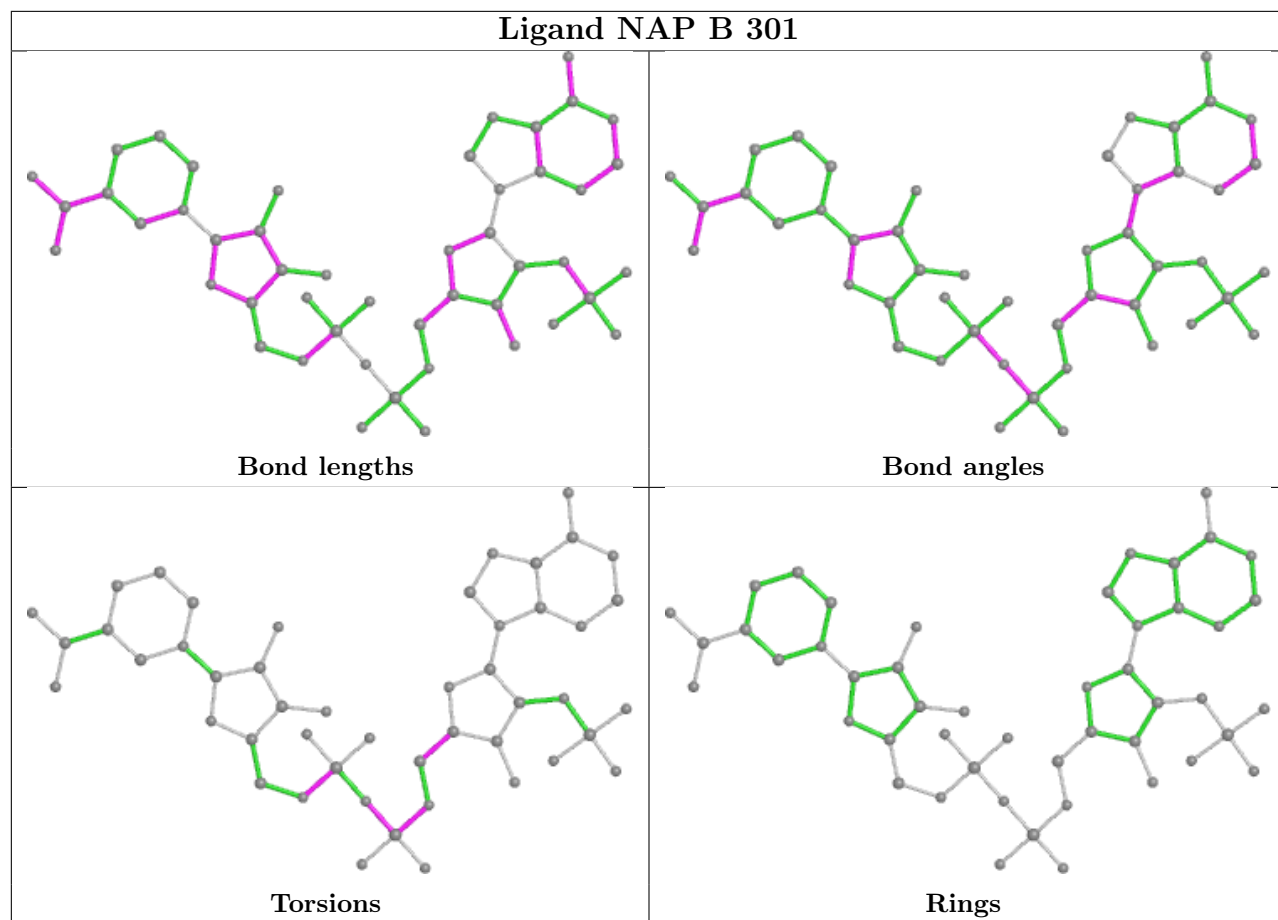
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	L	301	NAP	1	0
2	I	301	NAP	1	0
2	H	301	NAP	1	0
2	G	302	NAP	4	0
2	A	301	NAP	1	0
2	J	301	NAP	1	0
2	F	302	NAP	1	0

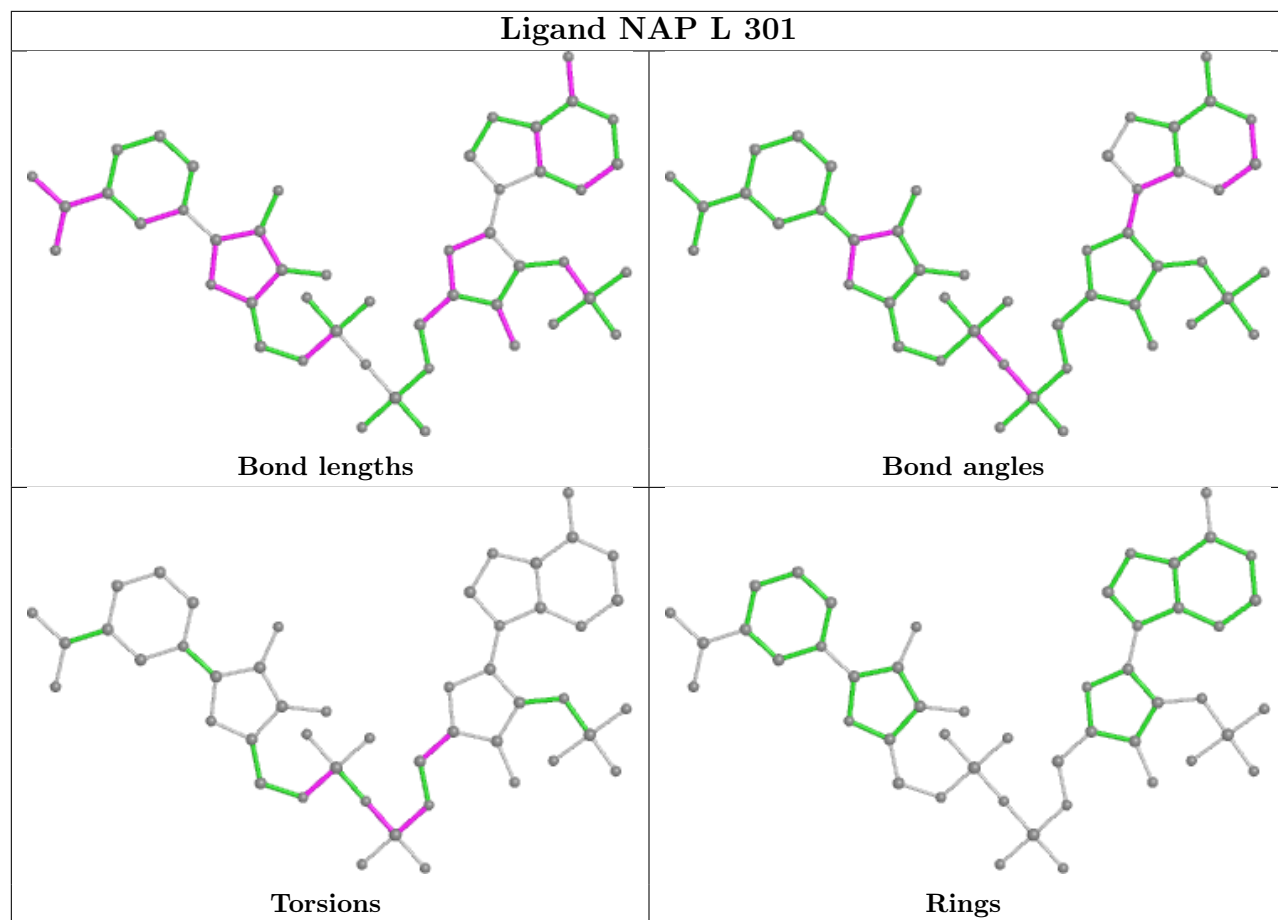
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. 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.

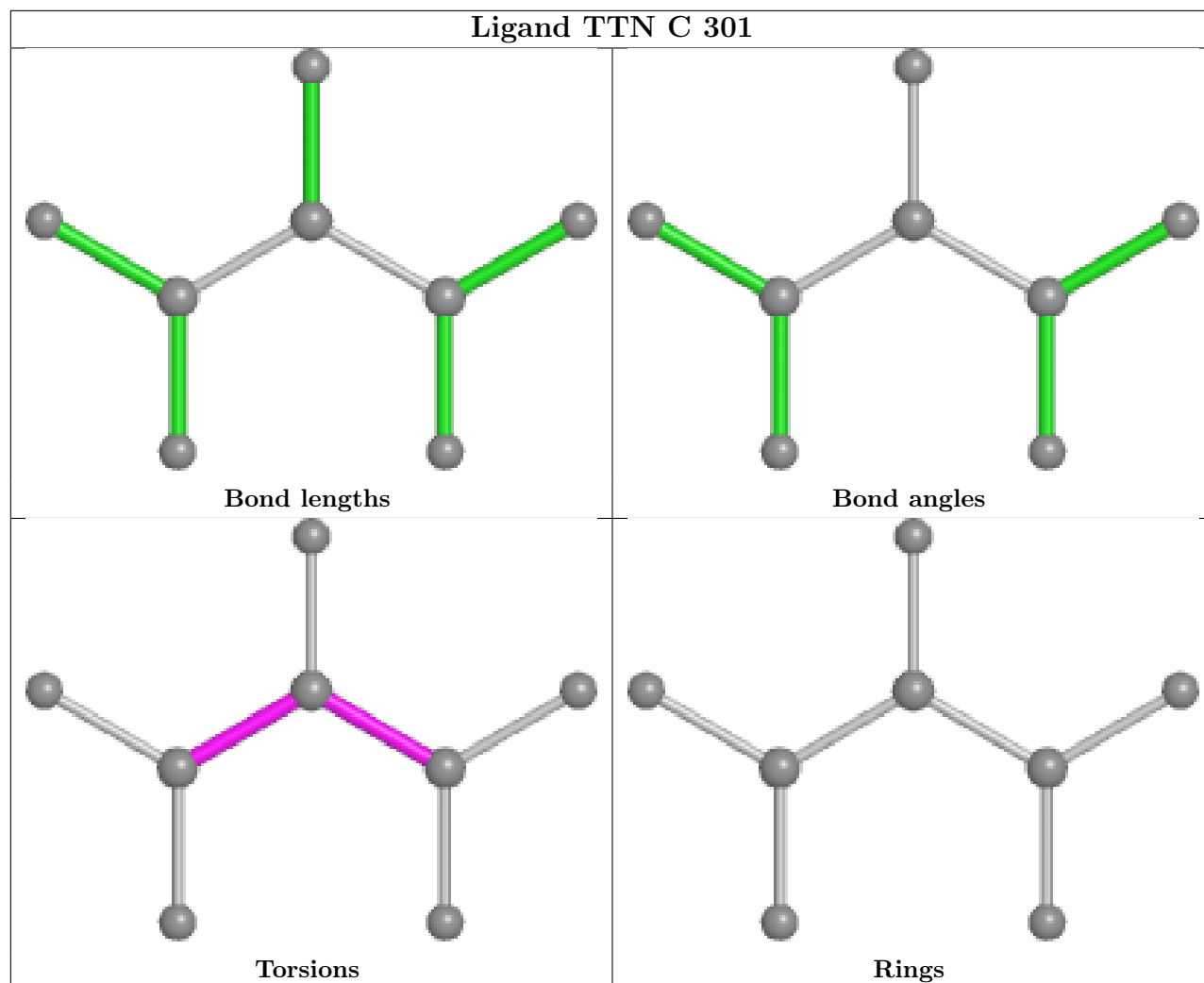


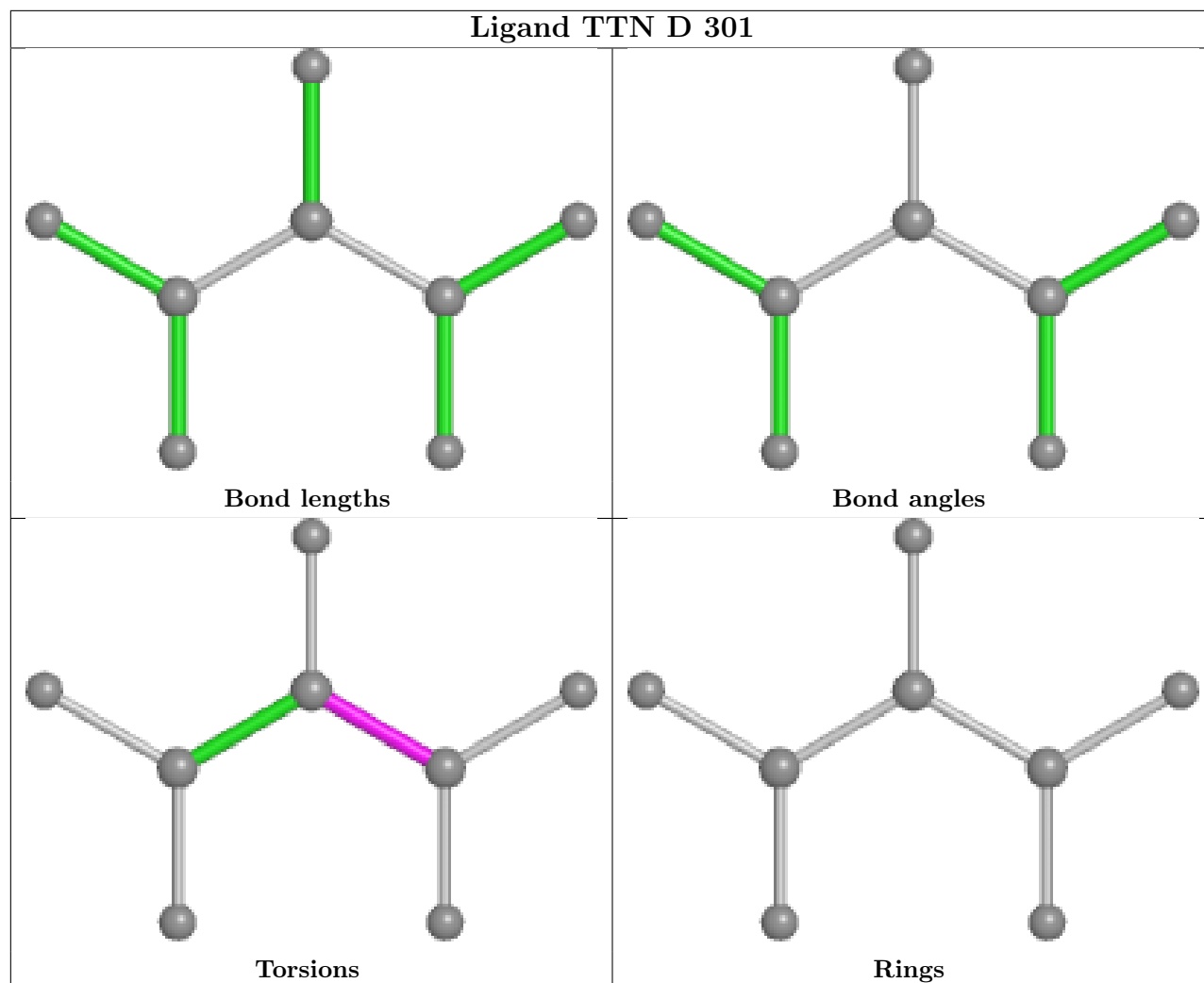


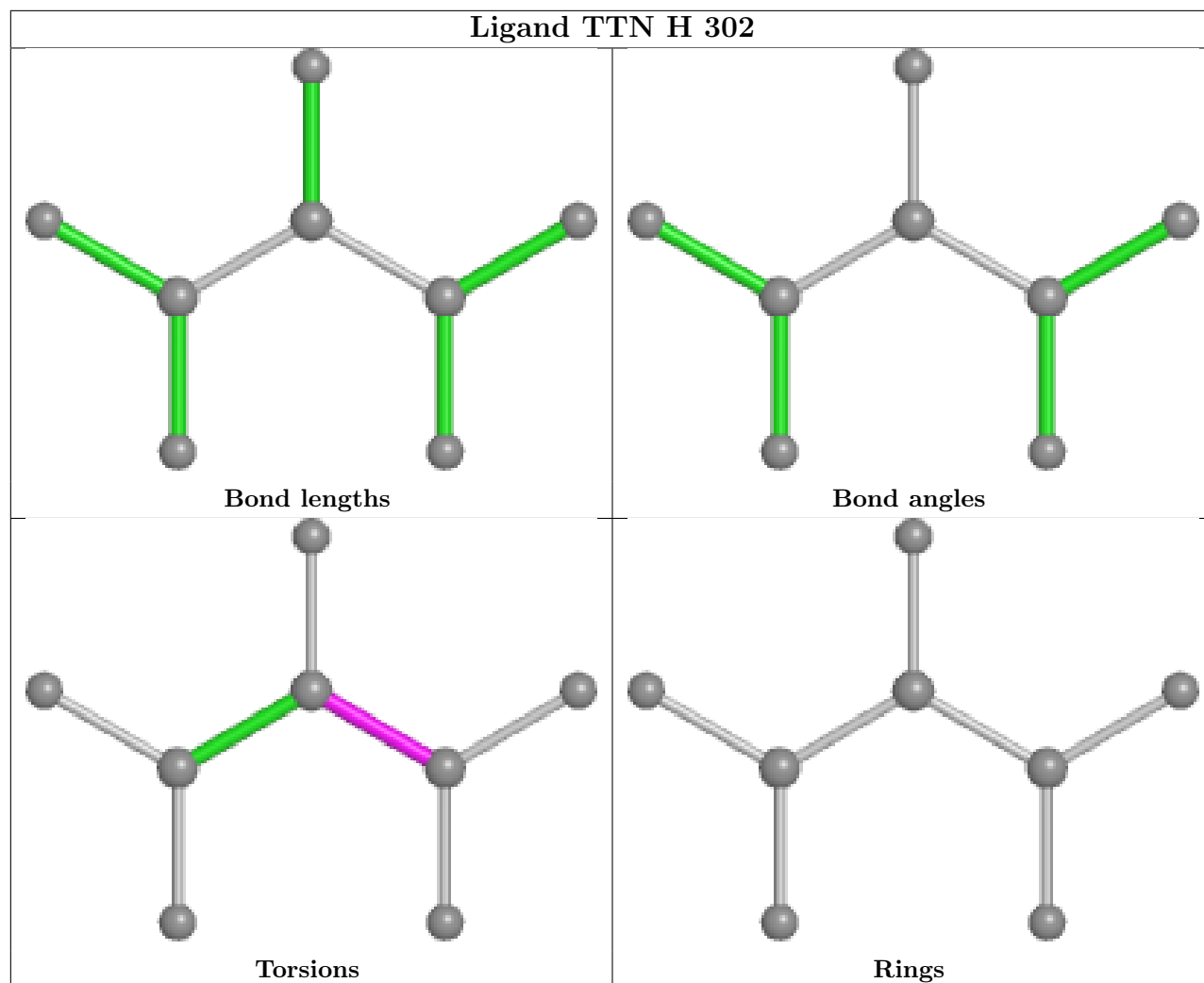


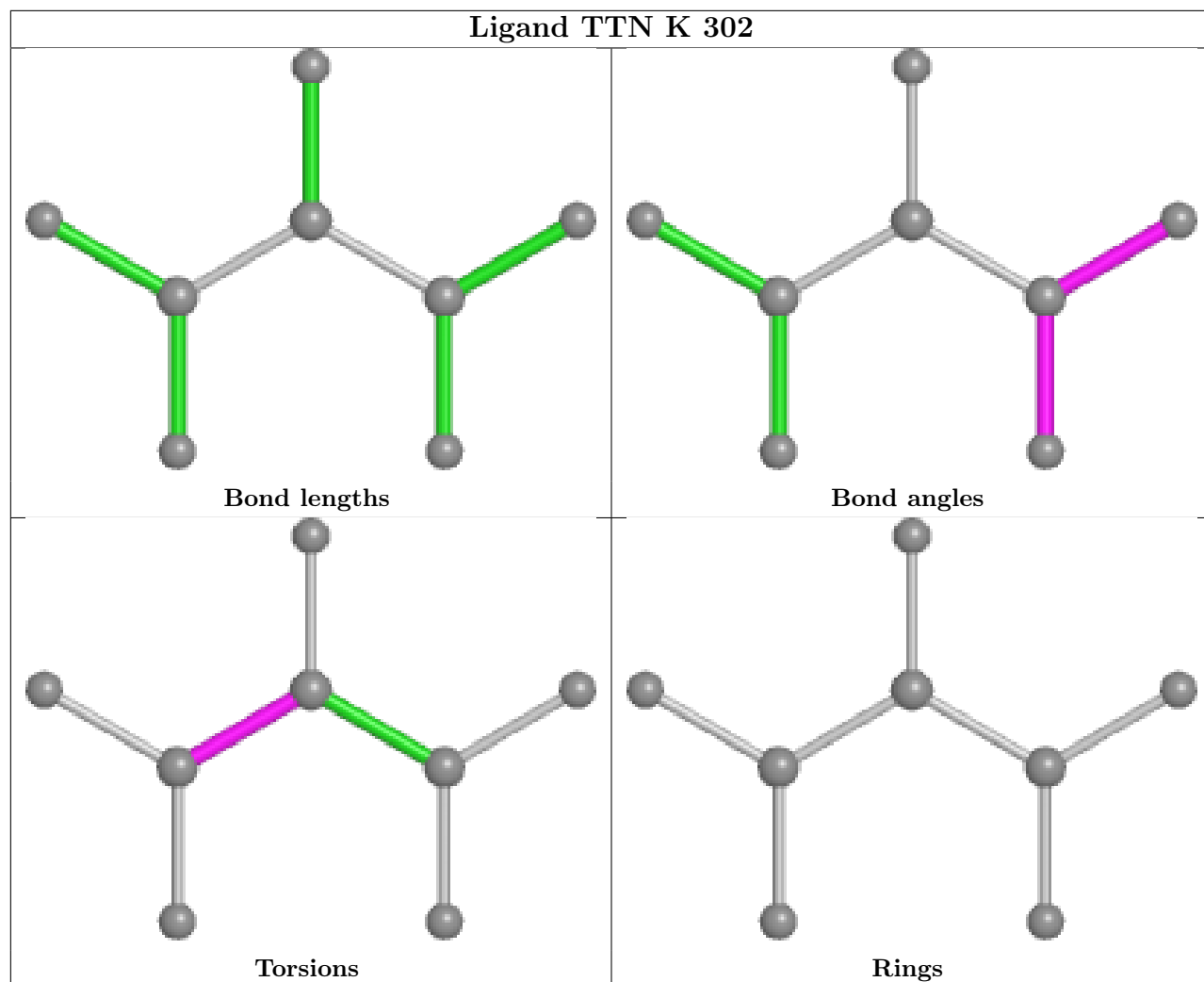


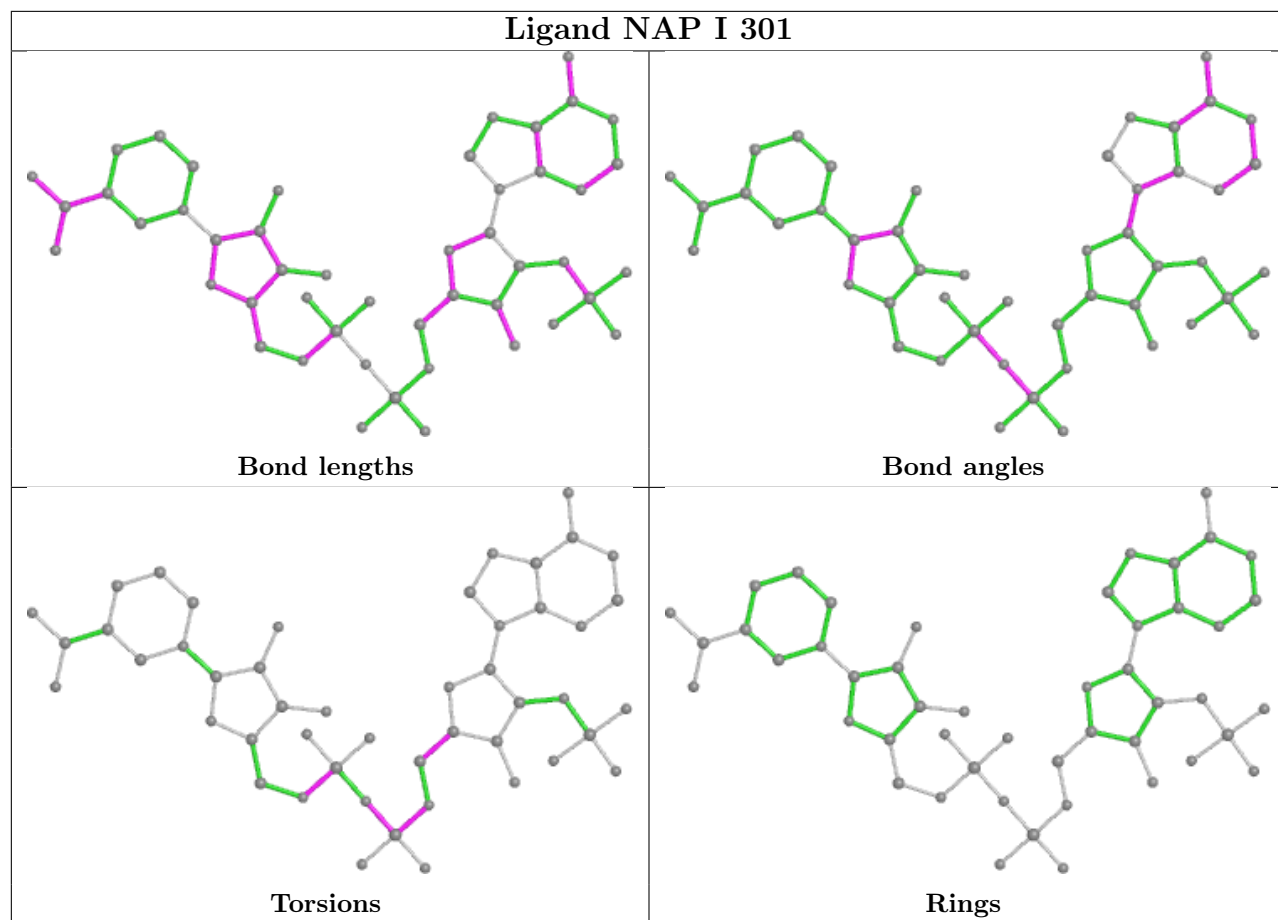


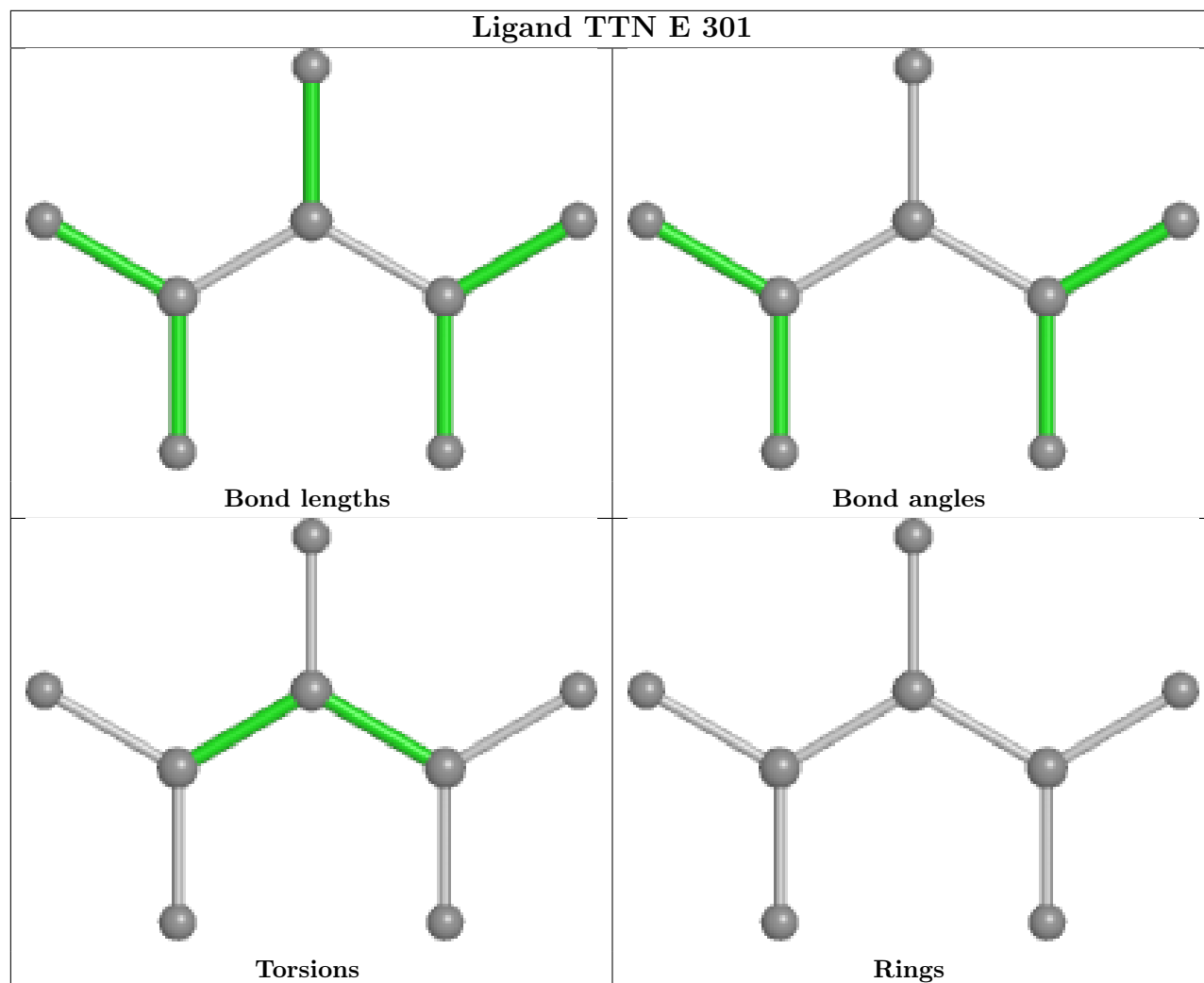


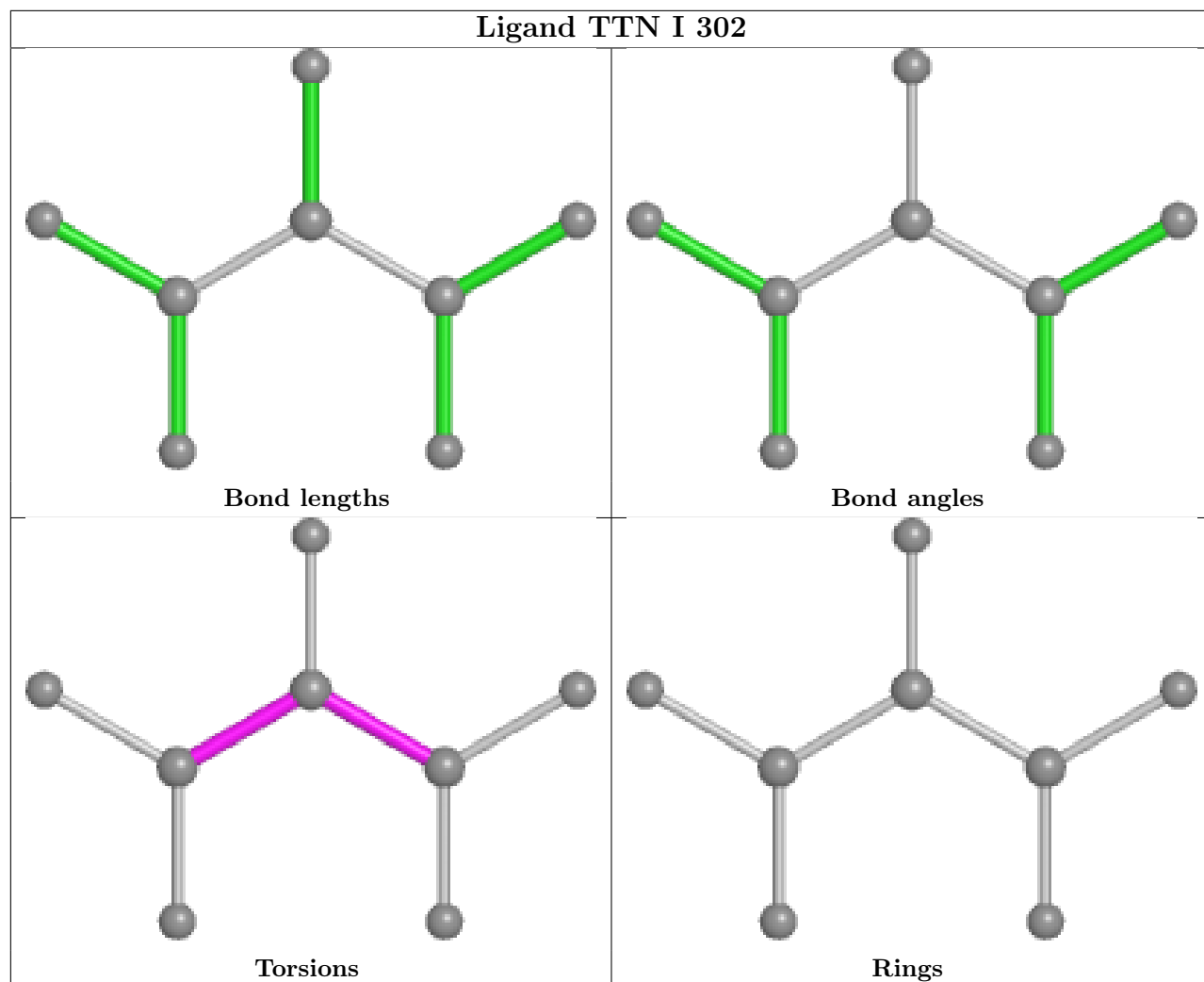


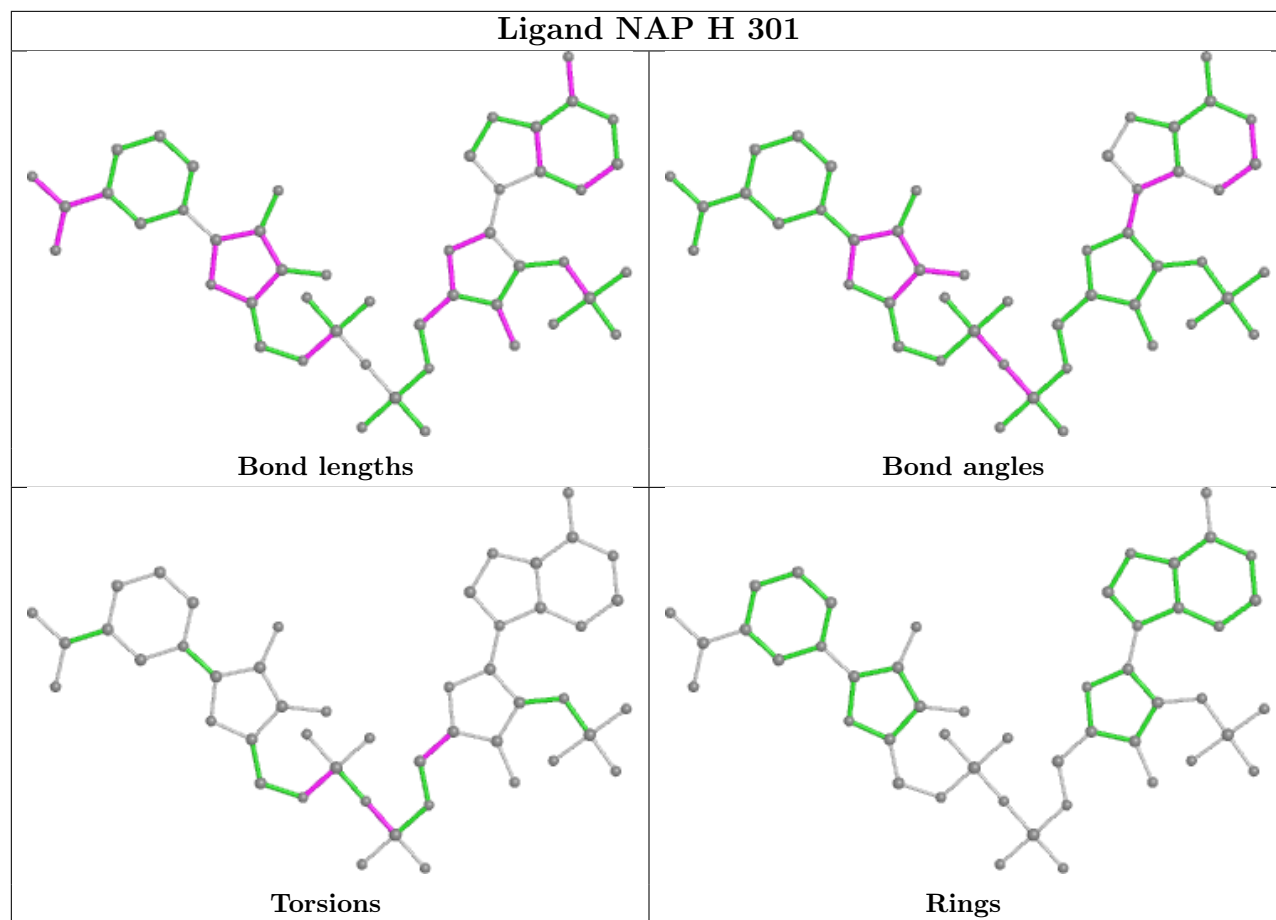


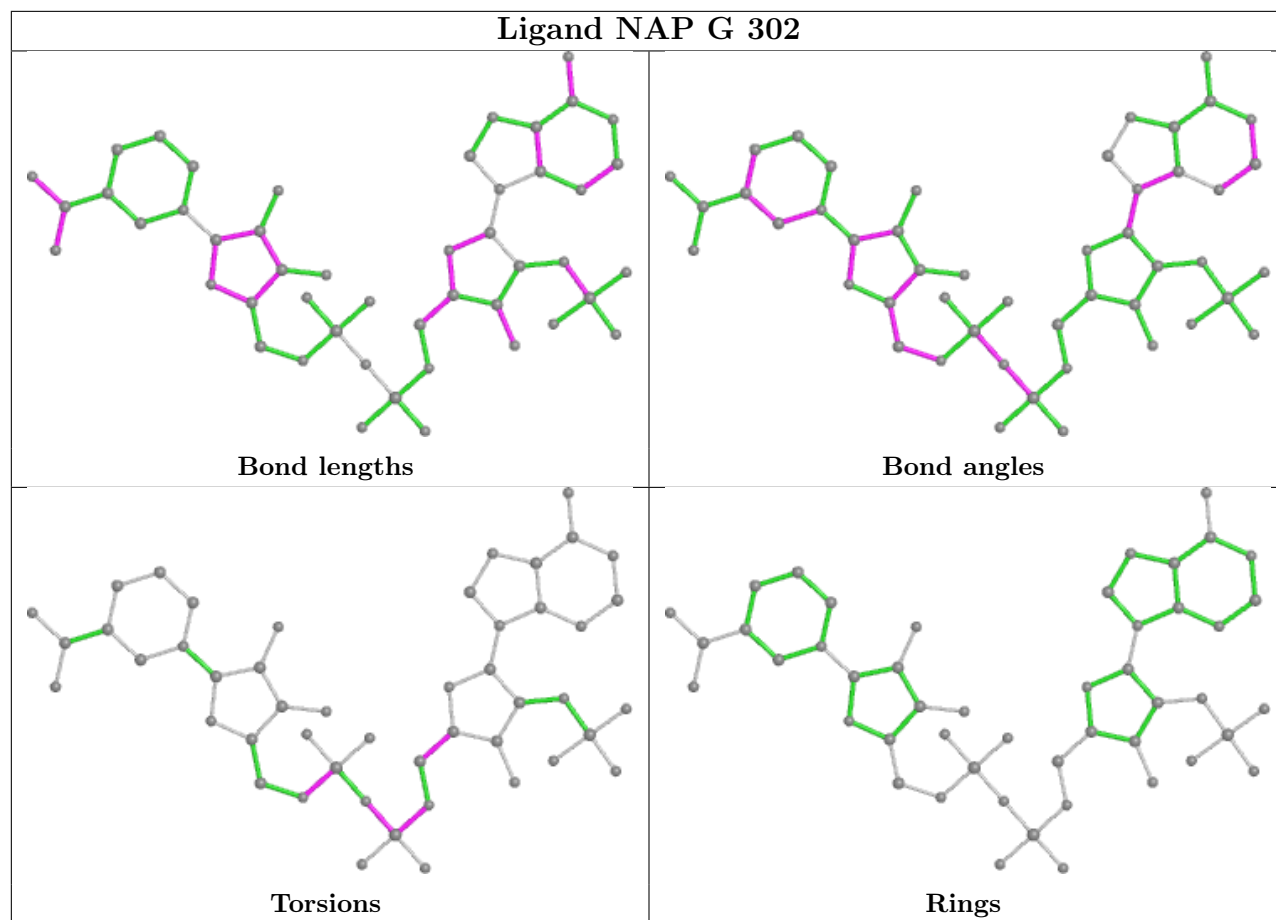


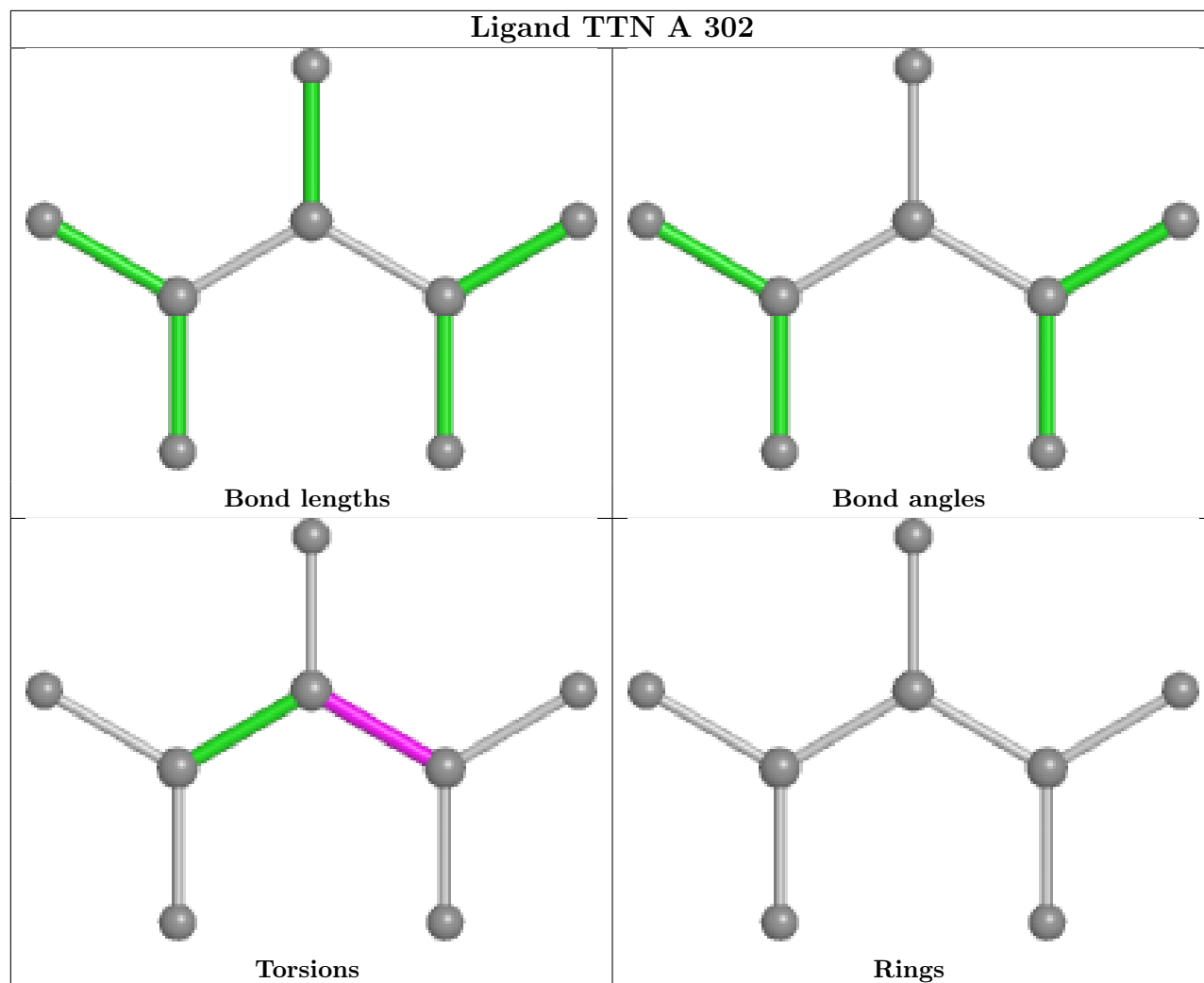


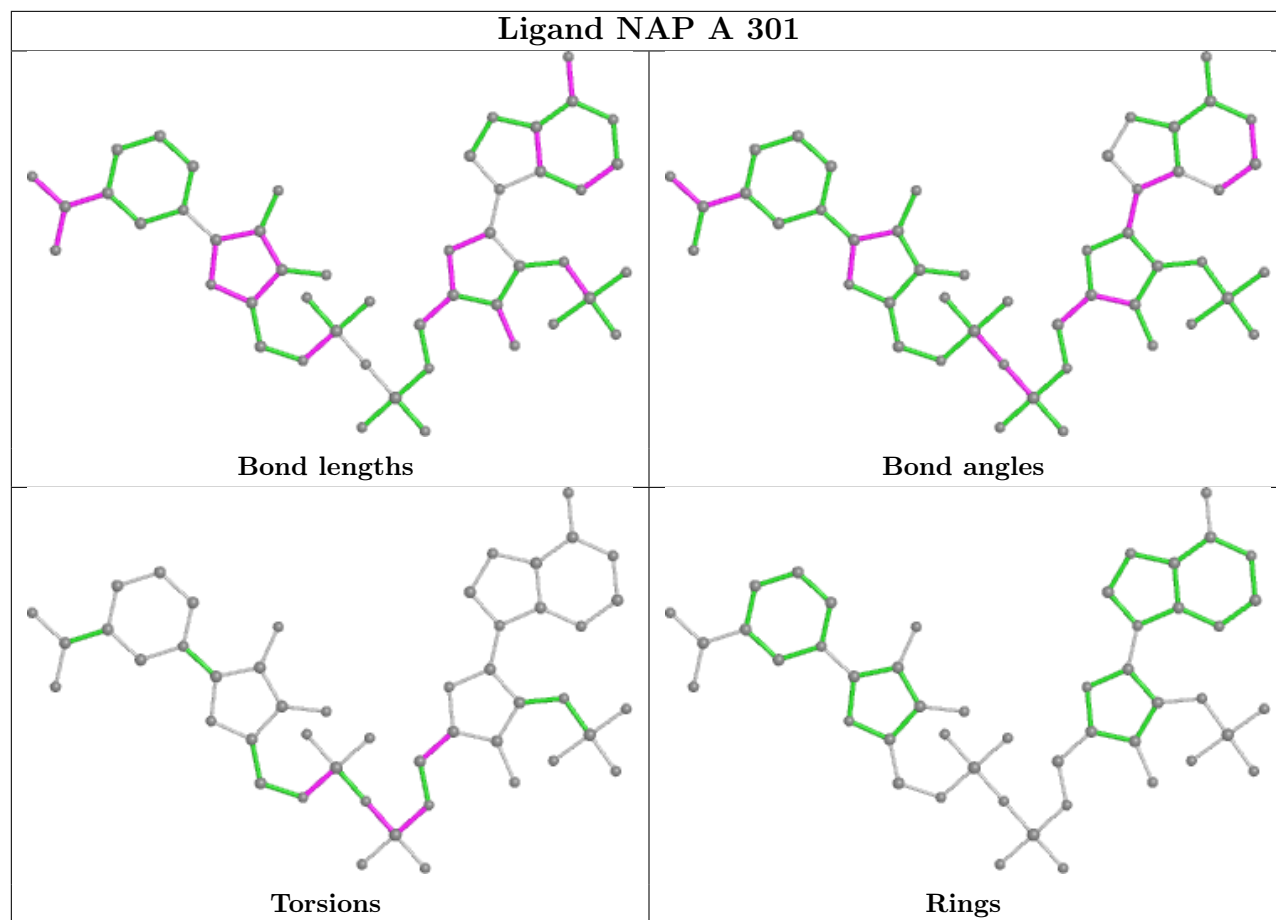


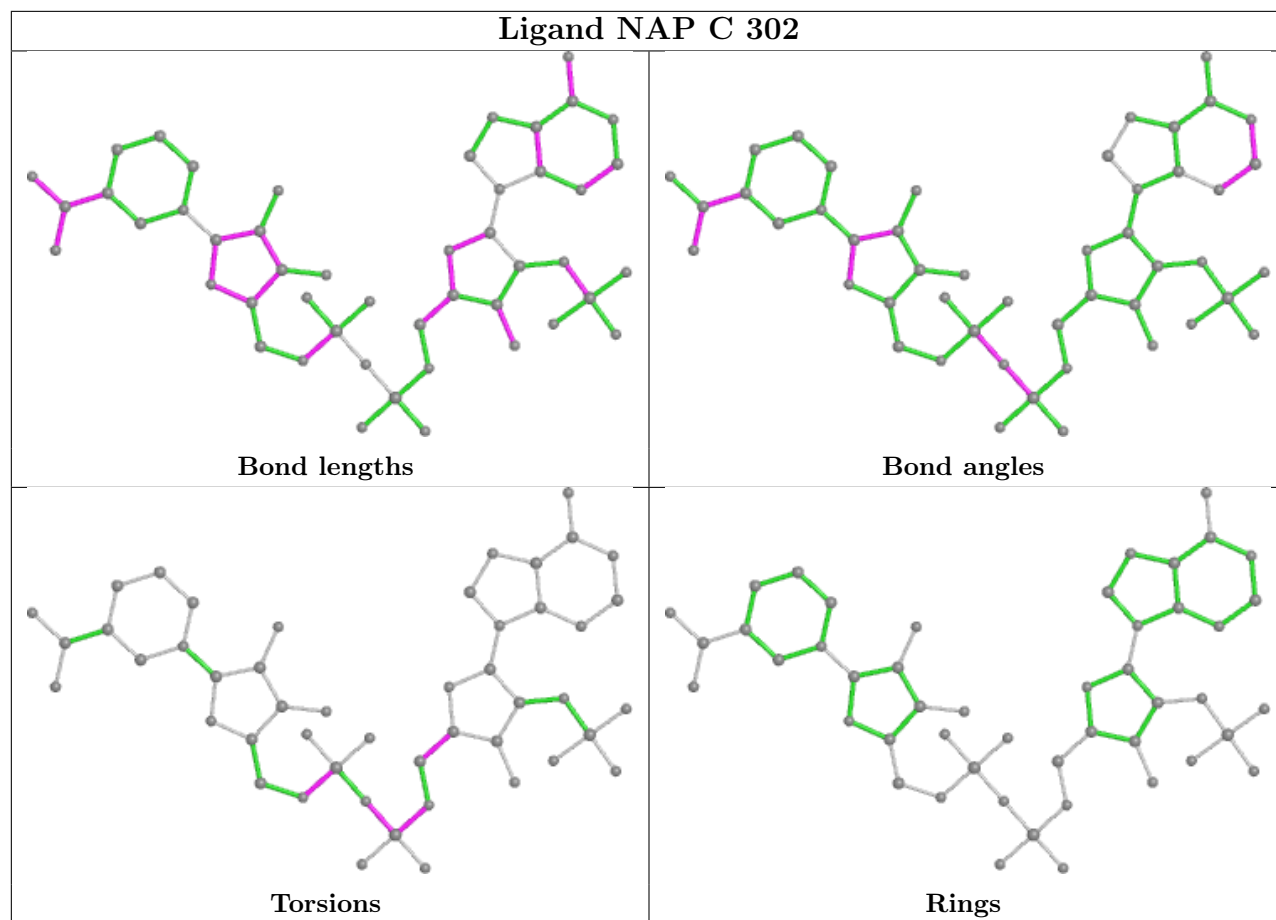


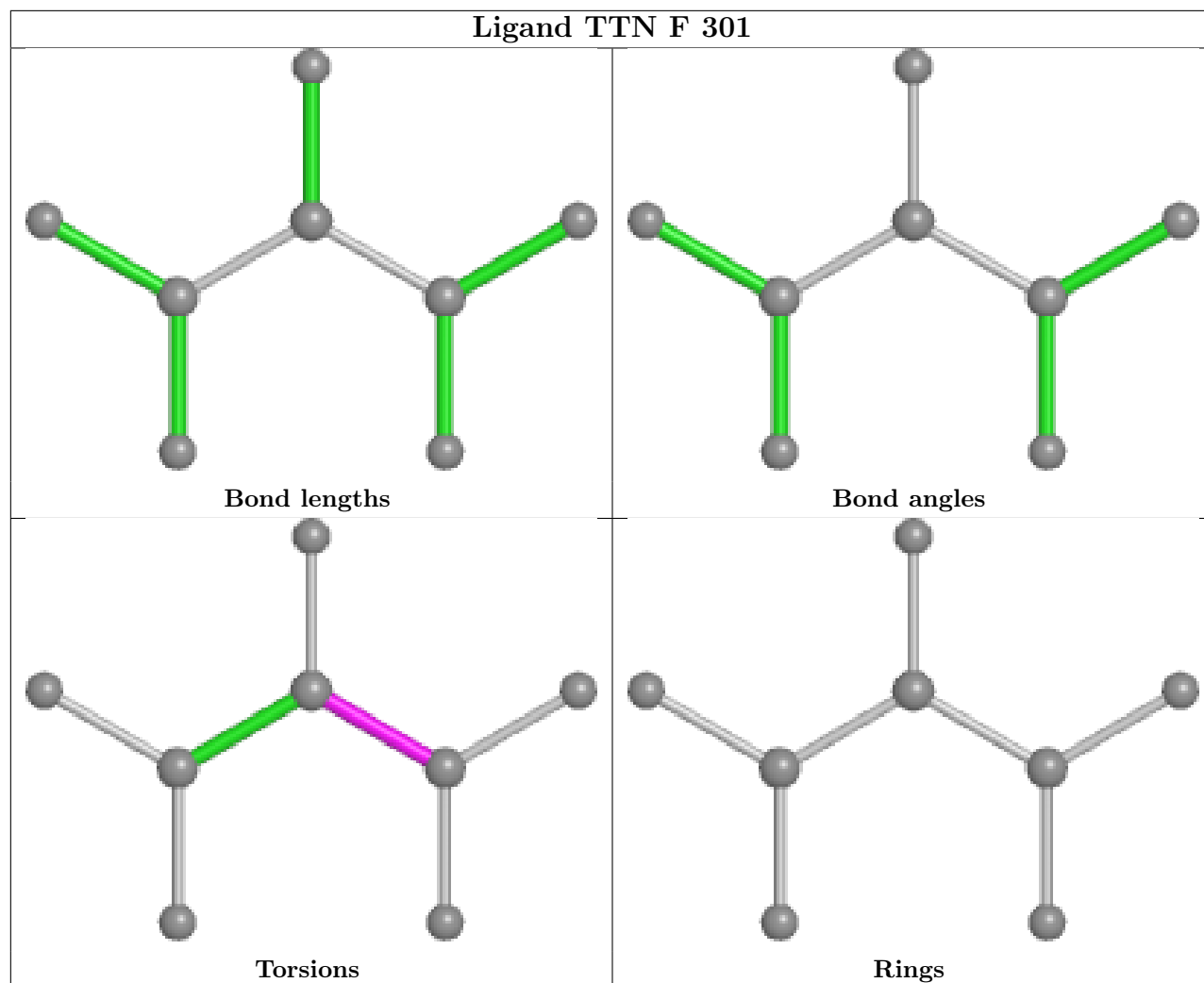


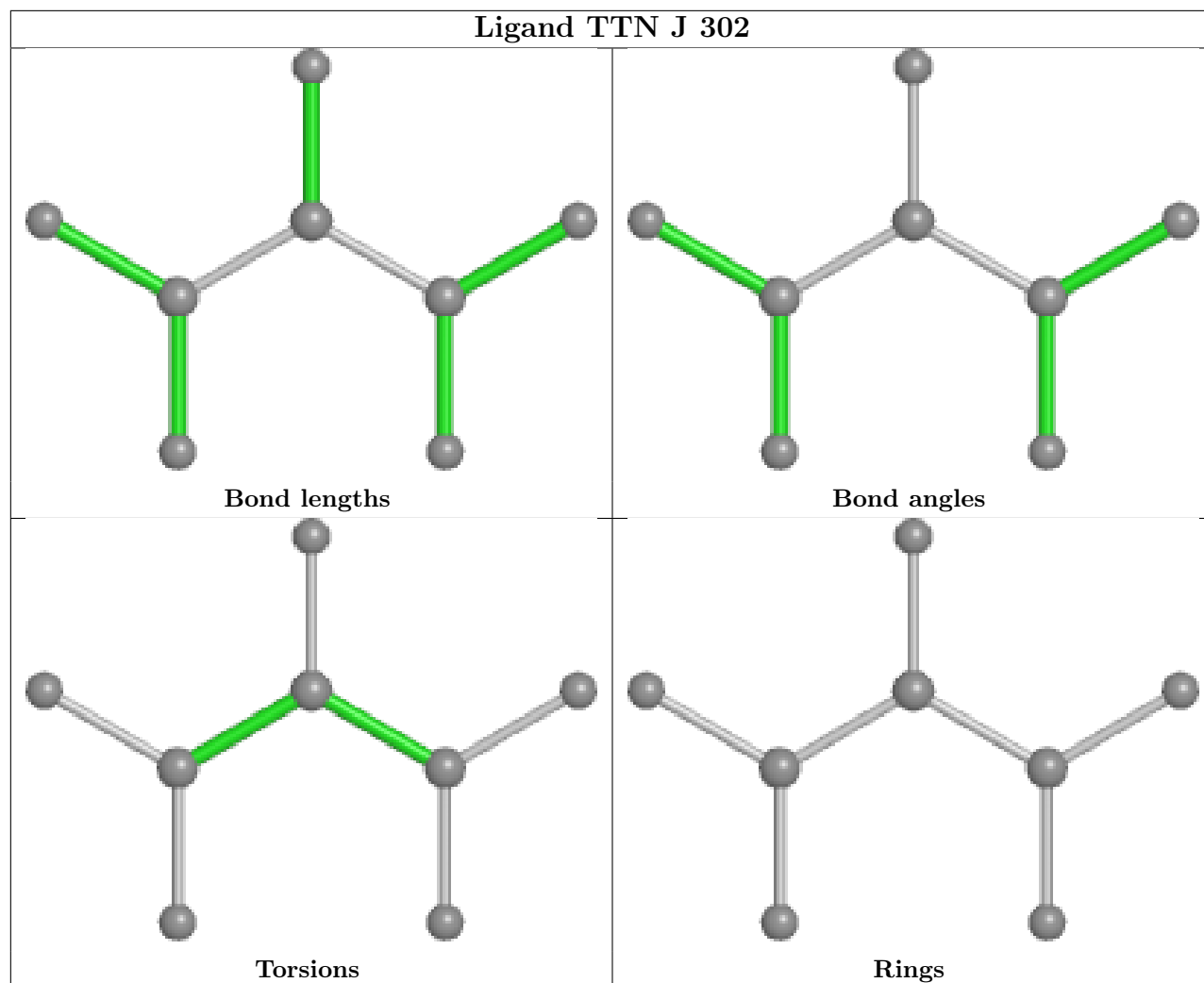


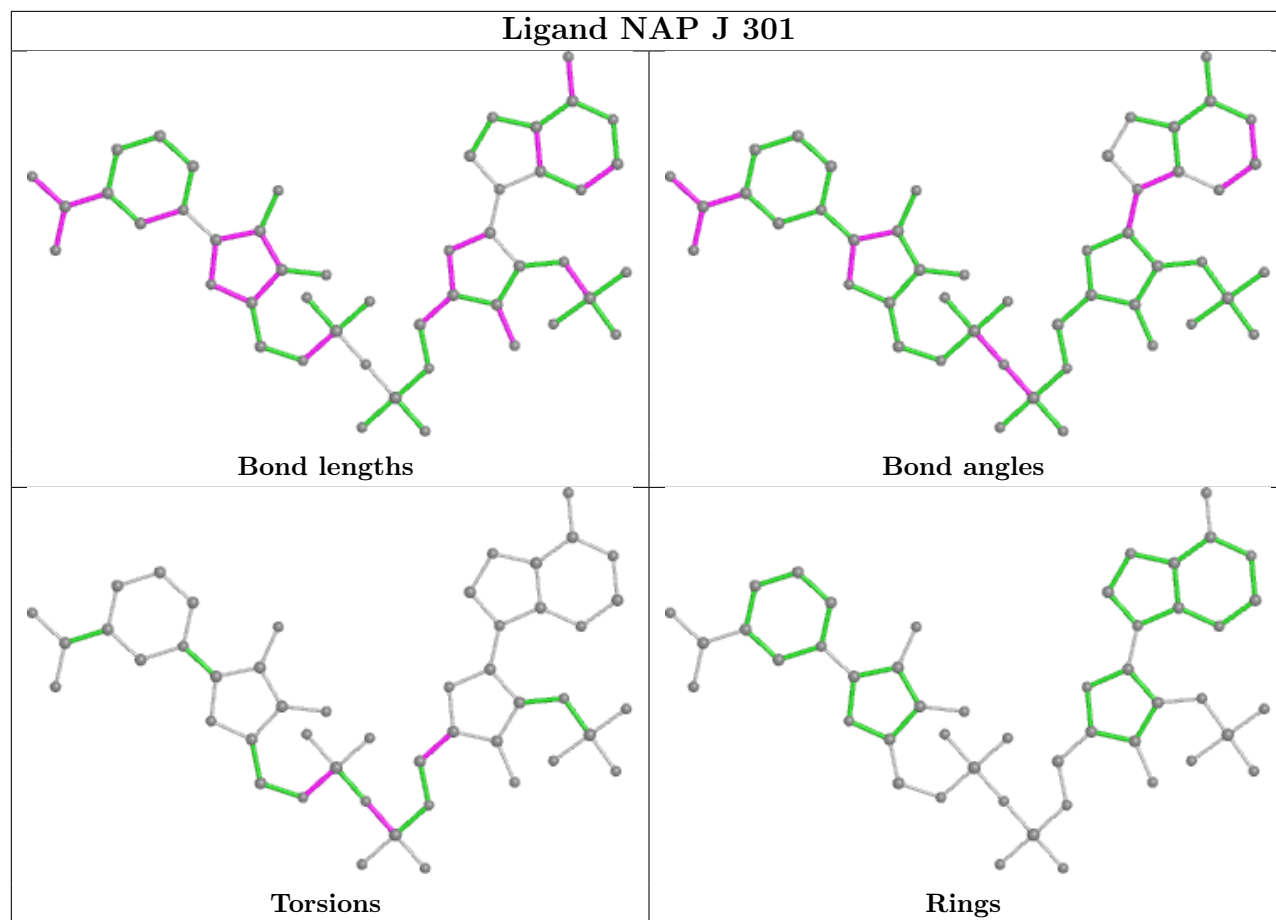


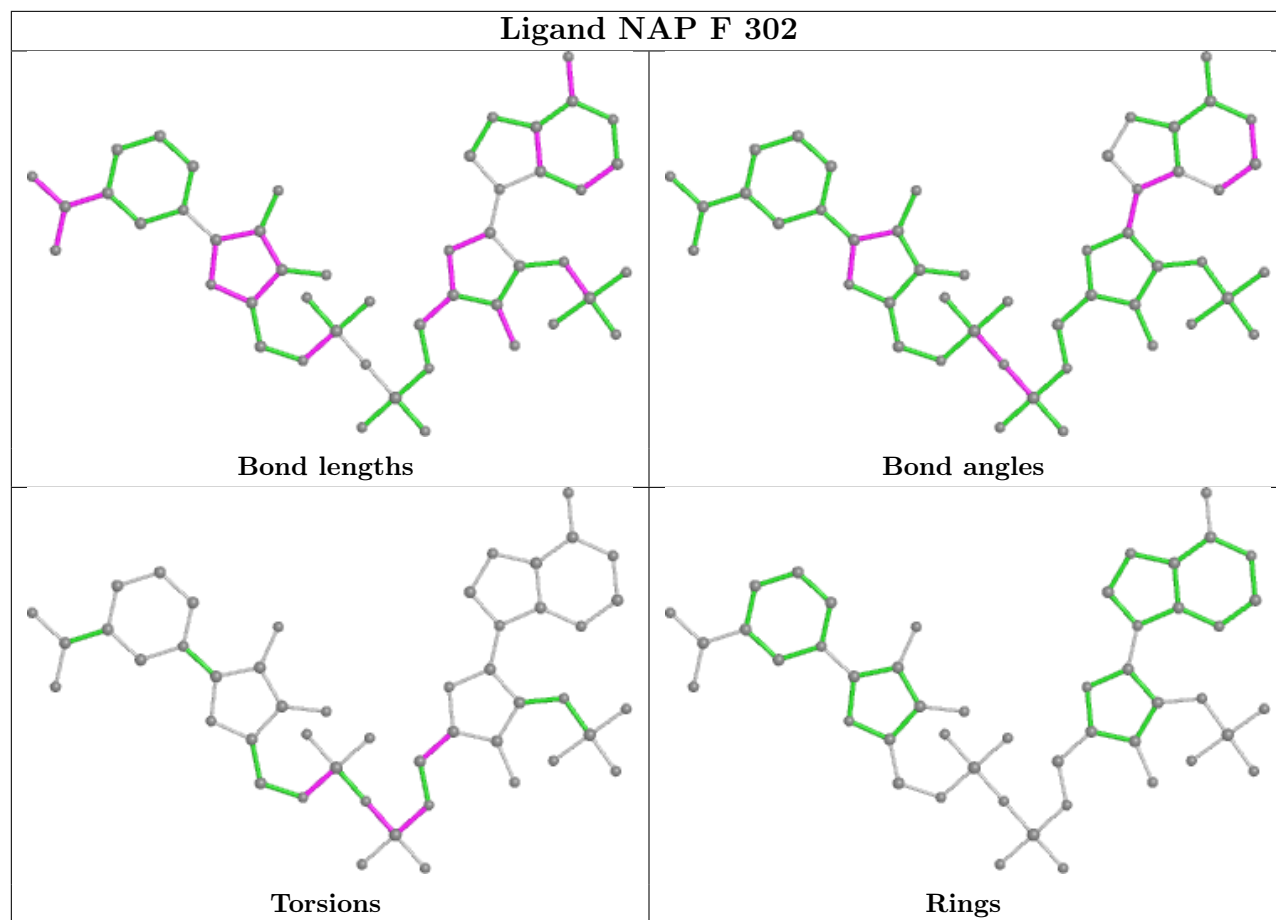


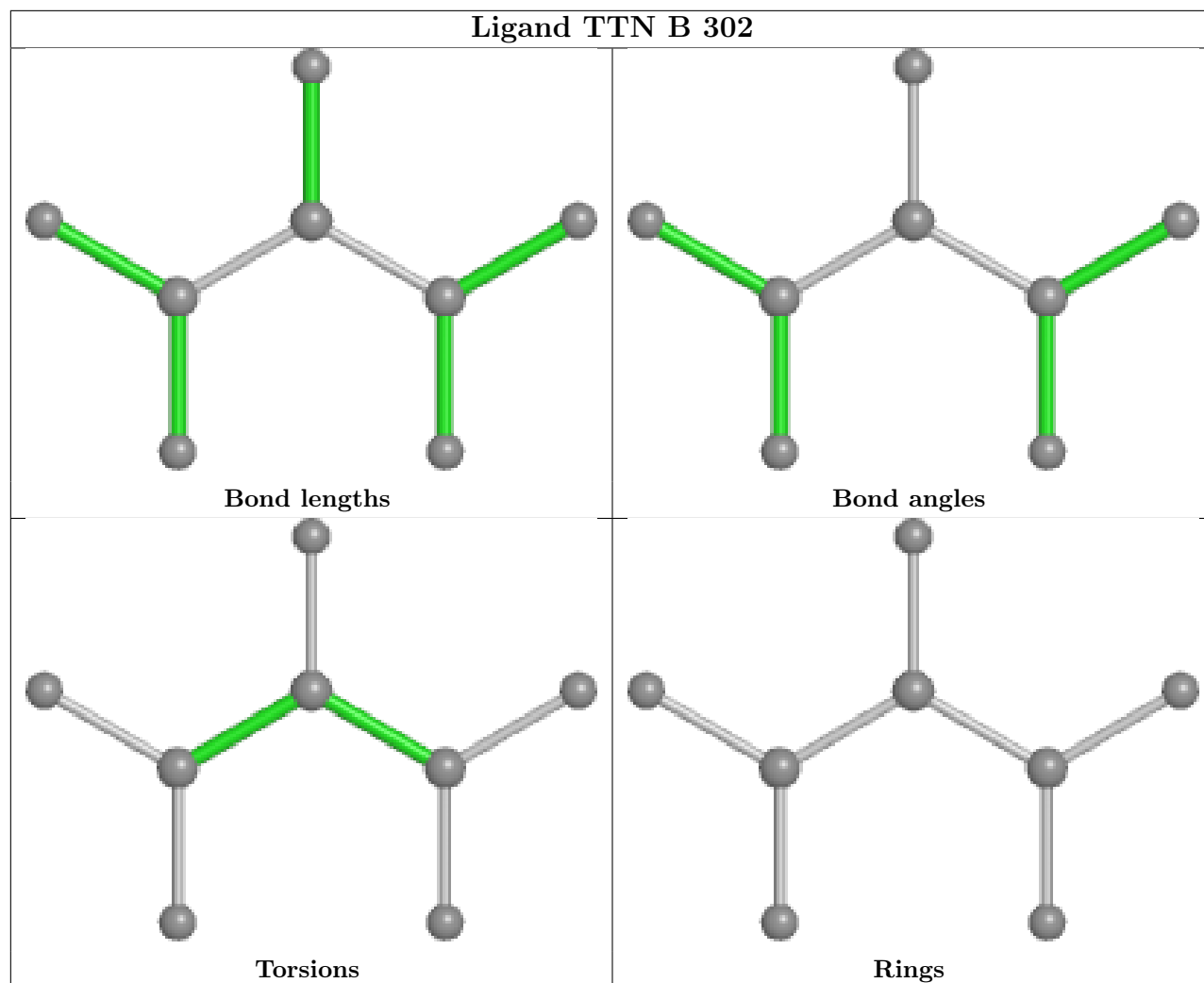


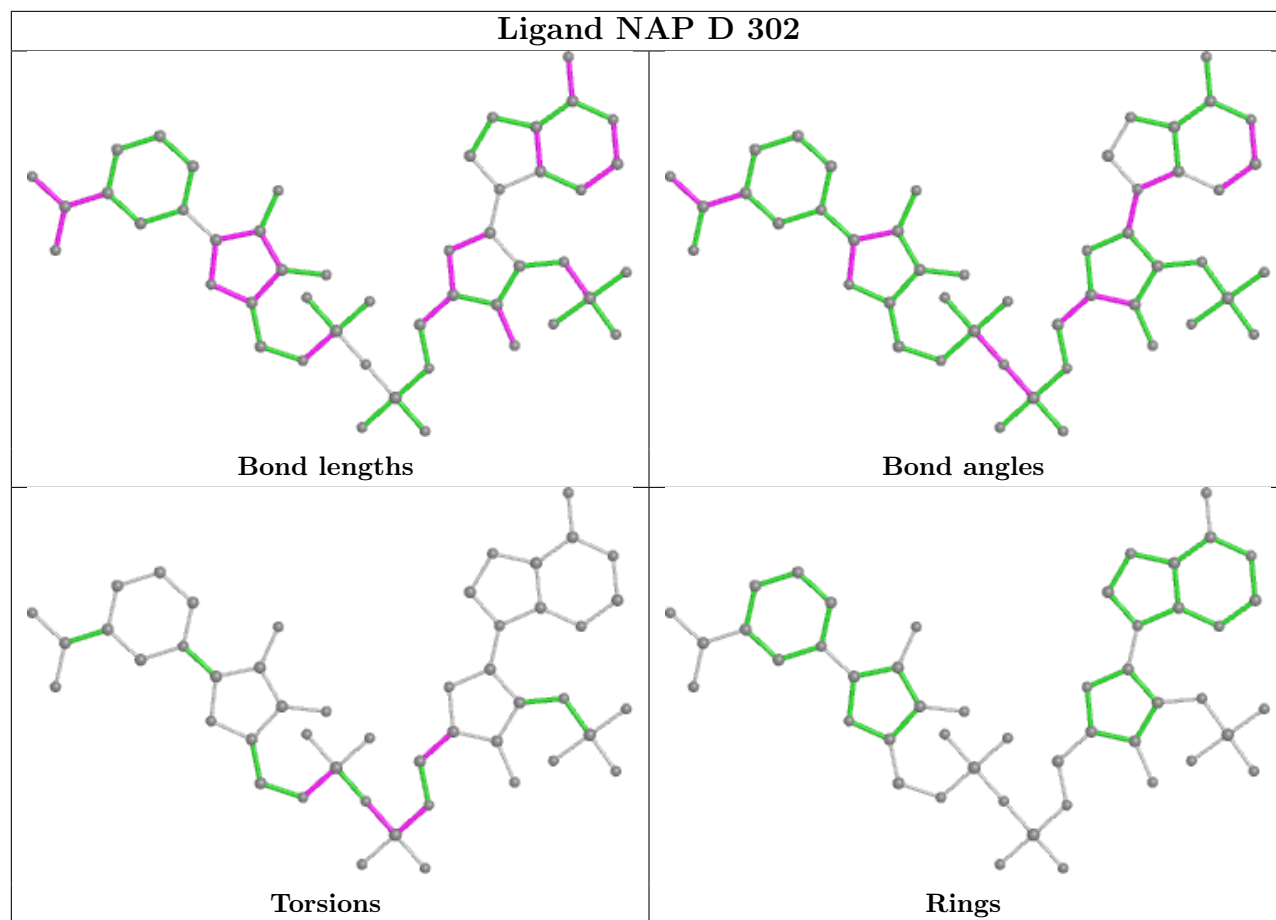


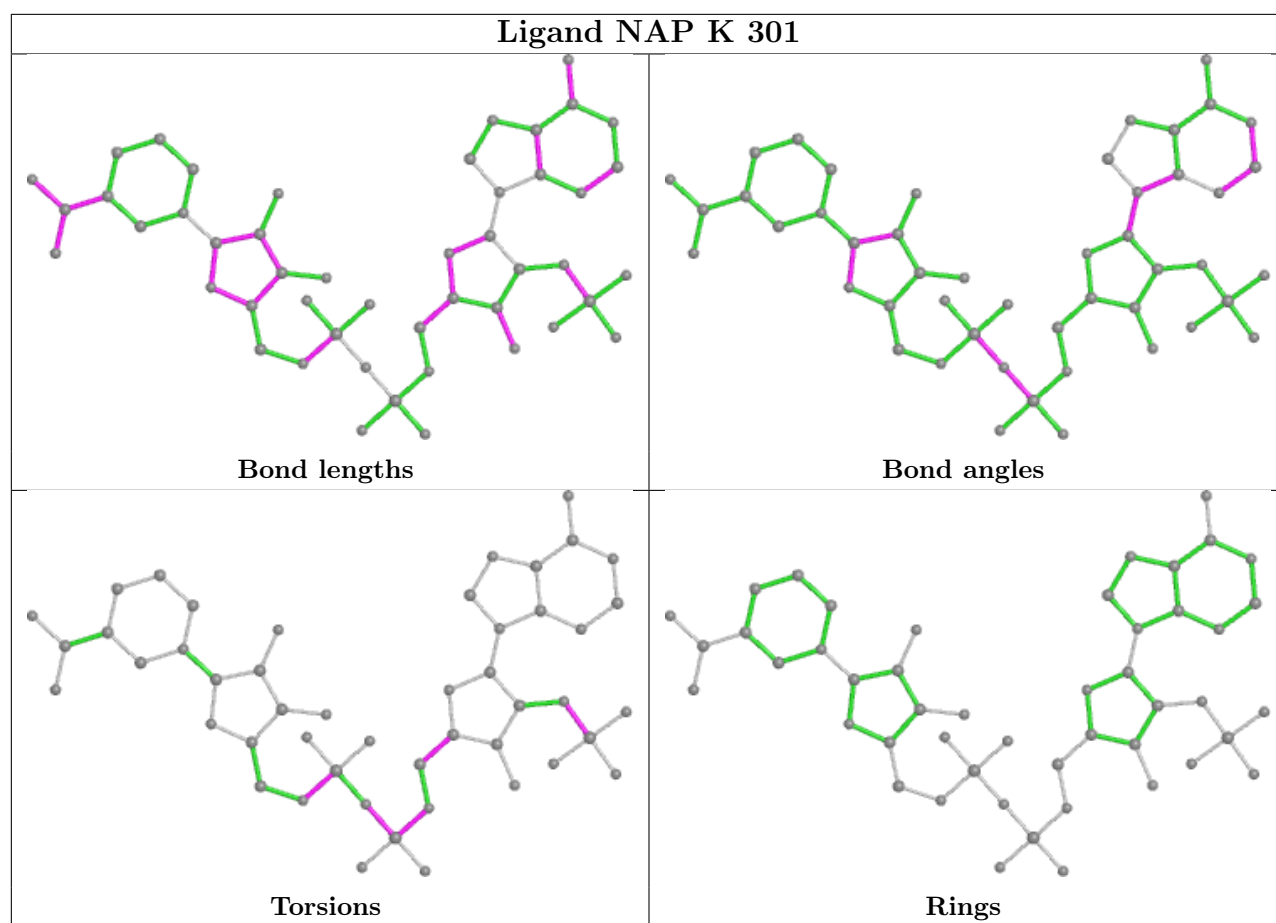












## 5.7 Other polymers [\(i\)](#)

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	234/255 (91%)	-0.52	0 100 100	5, 11, 22, 31	0
1	B	234/255 (91%)	-0.54	0 100 100	4, 10, 23, 27	0
1	C	235/255 (92%)	-0.46	0 100 100	5, 11, 24, 31	0
1	D	234/255 (91%)	-0.41	1 (0%) 89 90	5, 12, 27, 41	0
1	E	235/255 (92%)	-0.36	2 (0%) 81 82	5, 12, 27, 37	0
1	F	243/255 (95%)	-0.41	1 (0%) 89 90	6, 13, 26, 33	0
1	G	237/255 (92%)	-0.50	1 (0%) 89 90	5, 11, 24, 39	0
1	H	236/255 (92%)	-0.53	2 (0%) 82 83	4, 11, 23, 35	0
1	I	234/255 (91%)	-0.44	1 (0%) 89 90	6, 12, 26, 36	0
1	J	234/255 (91%)	-0.43	0 100 100	6, 13, 24, 36	0
1	K	234/255 (91%)	-0.44	5 (2%) 63 65	4, 12, 28, 42	0
1	L	243/255 (95%)	-0.46	0 100 100	4, 11, 24, 35	0
All	All	2833/3060 (92%)	-0.46	13 (0%) 87 88	4, 12, 25, 42	0

The worst 5 of 13 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	E	184	THR	3.0
1	I	203	ILE	3.0
1	K	195	PRO	2.8
1	E	74	ARG	2.7
1	K	193	GLY	2.7

### 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](#)

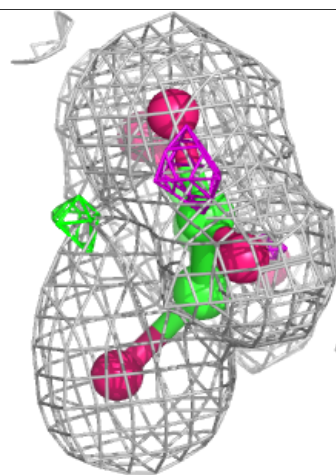
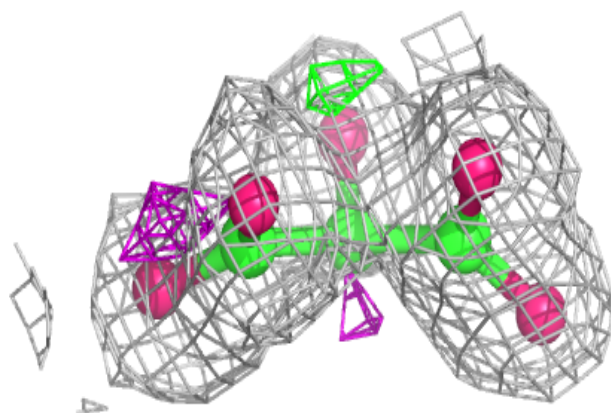
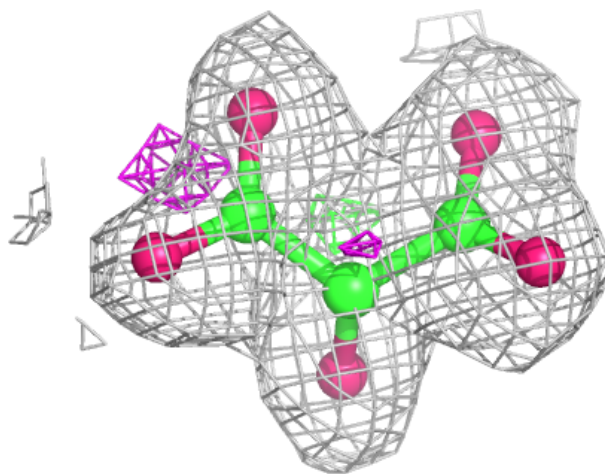
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95<sup>th</sup> percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 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
3	TTN	I	302	8/8	0.91	0.10	13,17,21,22	0
3	TTN	H	302	8/8	0.94	0.10	8,11,15,16	0
3	TTN	K	302	8/8	0.94	0.09	8,15,16,18	0
3	TTN	C	301	8/8	0.95	0.07	11,13,16,16	0
3	TTN	E	301	8/8	0.95	0.09	11,14,19,19	0
3	TTN	F	301	8/8	0.95	0.08	12,13,15,15	0
2	NAP	E	302	48/48	0.95	0.07	8,17,24,29	0
2	NAP	G	302	48/48	0.95	0.07	5,12,17,19	0
3	TTN	B	302	8/8	0.95	0.07	10,12,15,16	0
2	NAP	K	301	48/48	0.96	0.06	9,13,18,19	0
3	TTN	A	302	8/8	0.96	0.10	11,13,16,17	0
3	TTN	G	301	8/8	0.96	0.05	8,12,13,13	0
2	NAP	D	302	48/48	0.96	0.07	8,14,20,22	0
2	NAP	I	301	48/48	0.96	0.06	7,15,19,20	0
3	TTN	D	301	8/8	0.96	0.08	13,15,18,18	0
2	NAP	A	301	48/48	0.97	0.06	6,12,14,18	0
2	NAP	J	301	48/48	0.97	0.06	8,13,16,20	0
2	NAP	B	301	48/48	0.97	0.06	7,12,16,18	0
2	NAP	L	301	48/48	0.97	0.05	5,10,13,16	0
2	NAP	F	302	48/48	0.97	0.06	8,12,16,19	0
2	NAP	C	302	48/48	0.97	0.05	8,13,18,22	0
3	TTN	J	302	8/8	0.97	0.06	10,12,16,18	0
2	NAP	H	301	48/48	0.97	0.05	5,10,15,16	0
3	TTN	L	302	8/8	0.97	0.05	6,10,16,16	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.

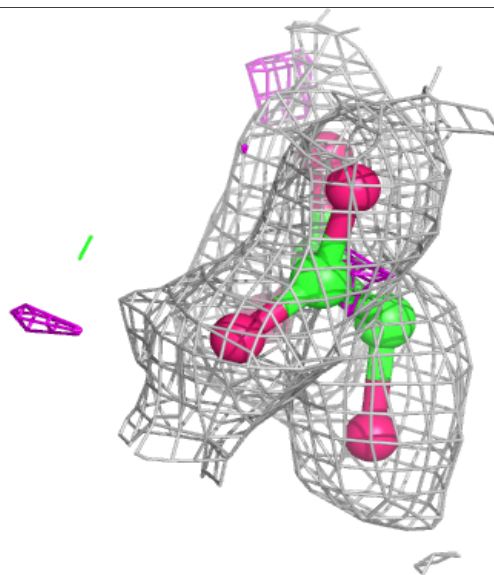
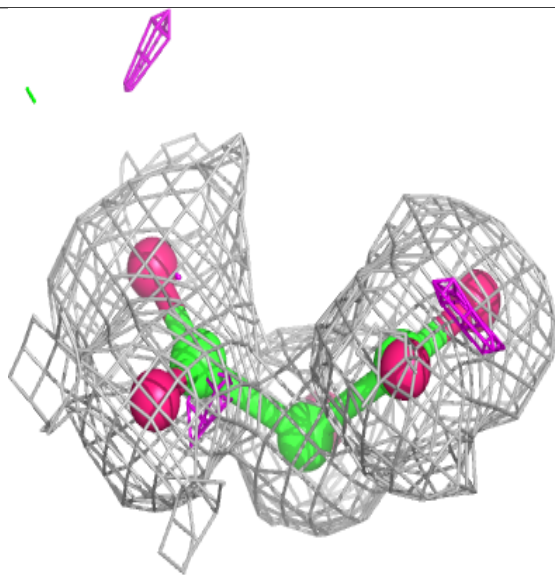
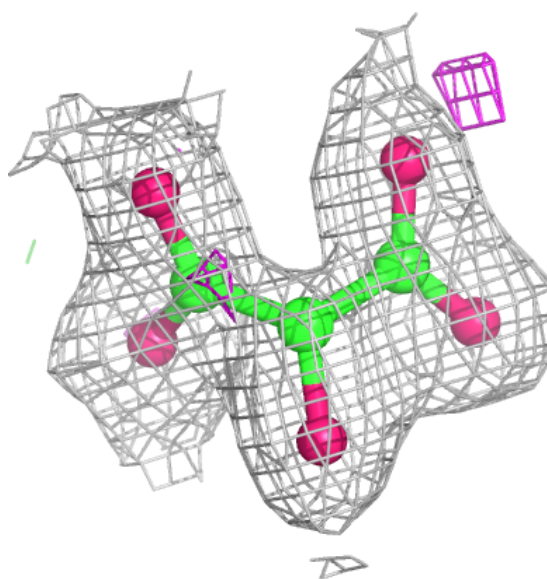
**Electron density around TTN I 302:**

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



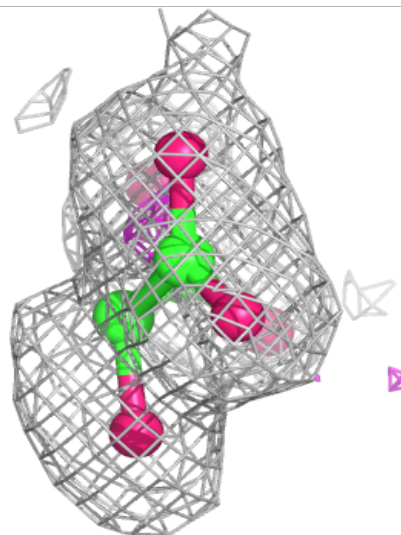
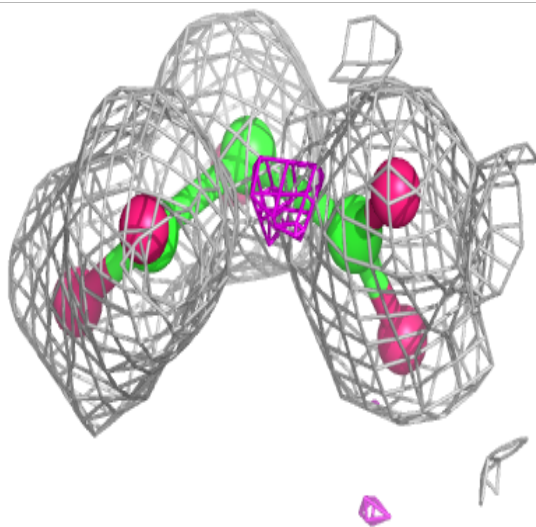
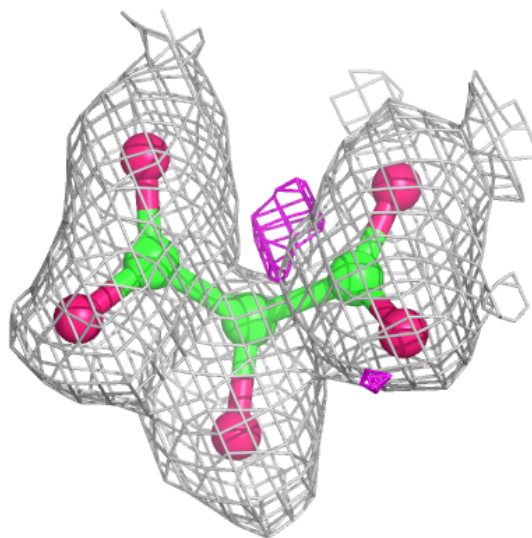
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and green (positive)



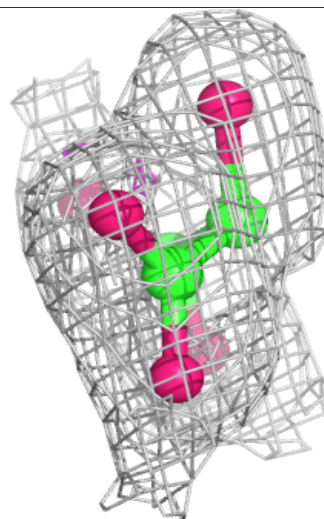
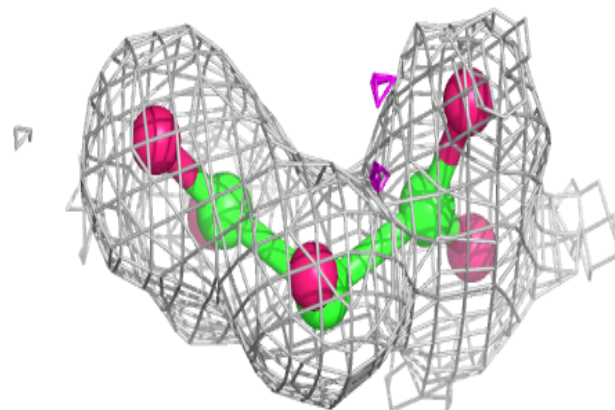
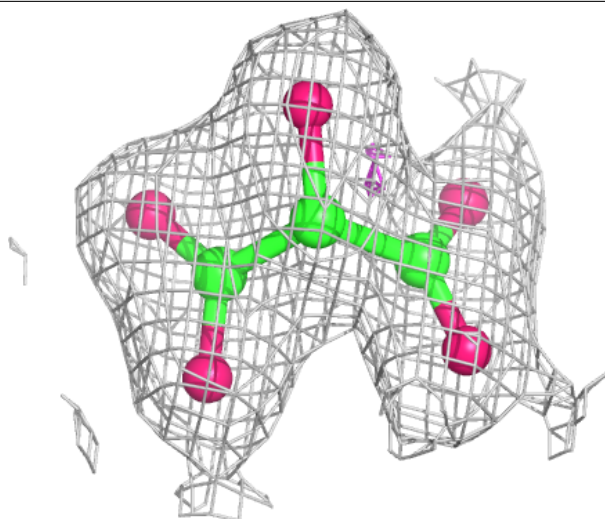
**Electron density around TTN K 302:**

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



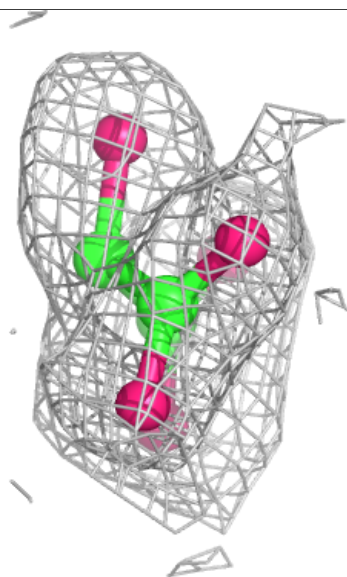
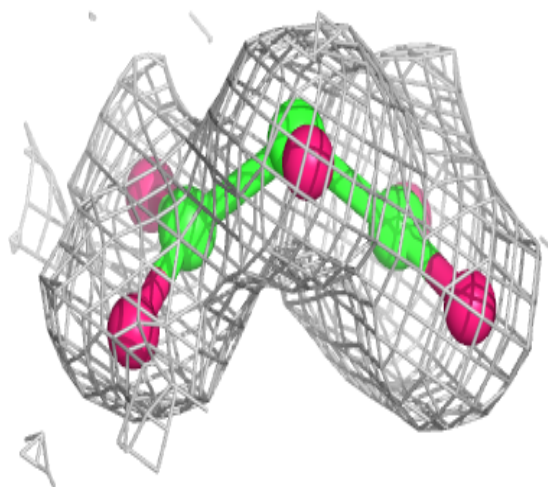
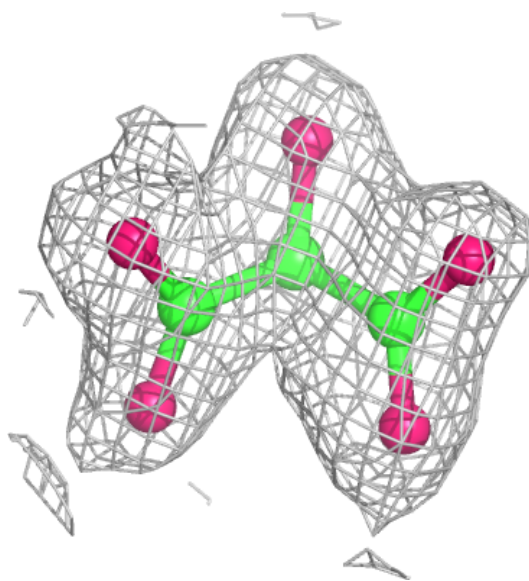
**Electron density around TTN C 301:**

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and green (positive)



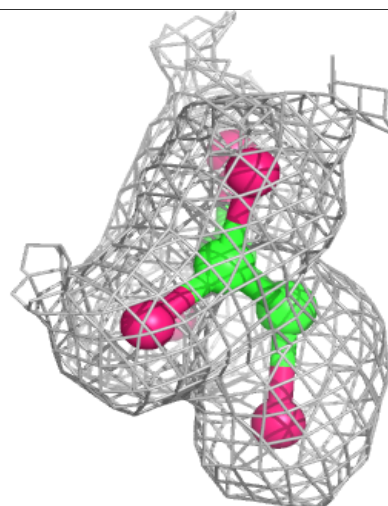
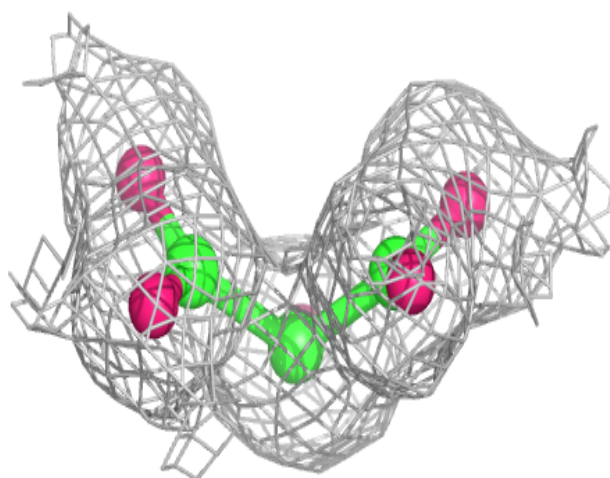
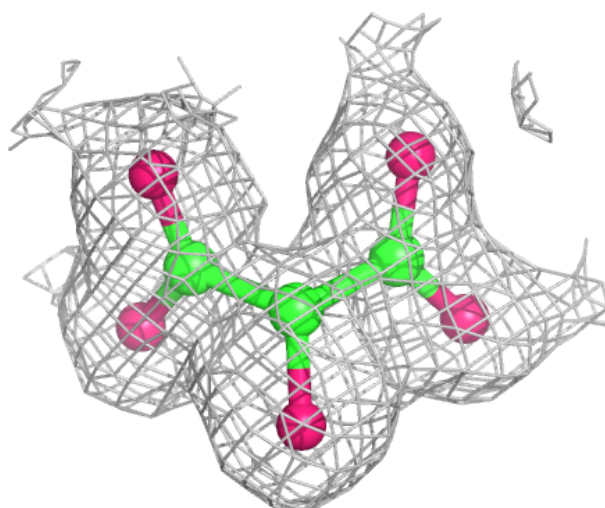
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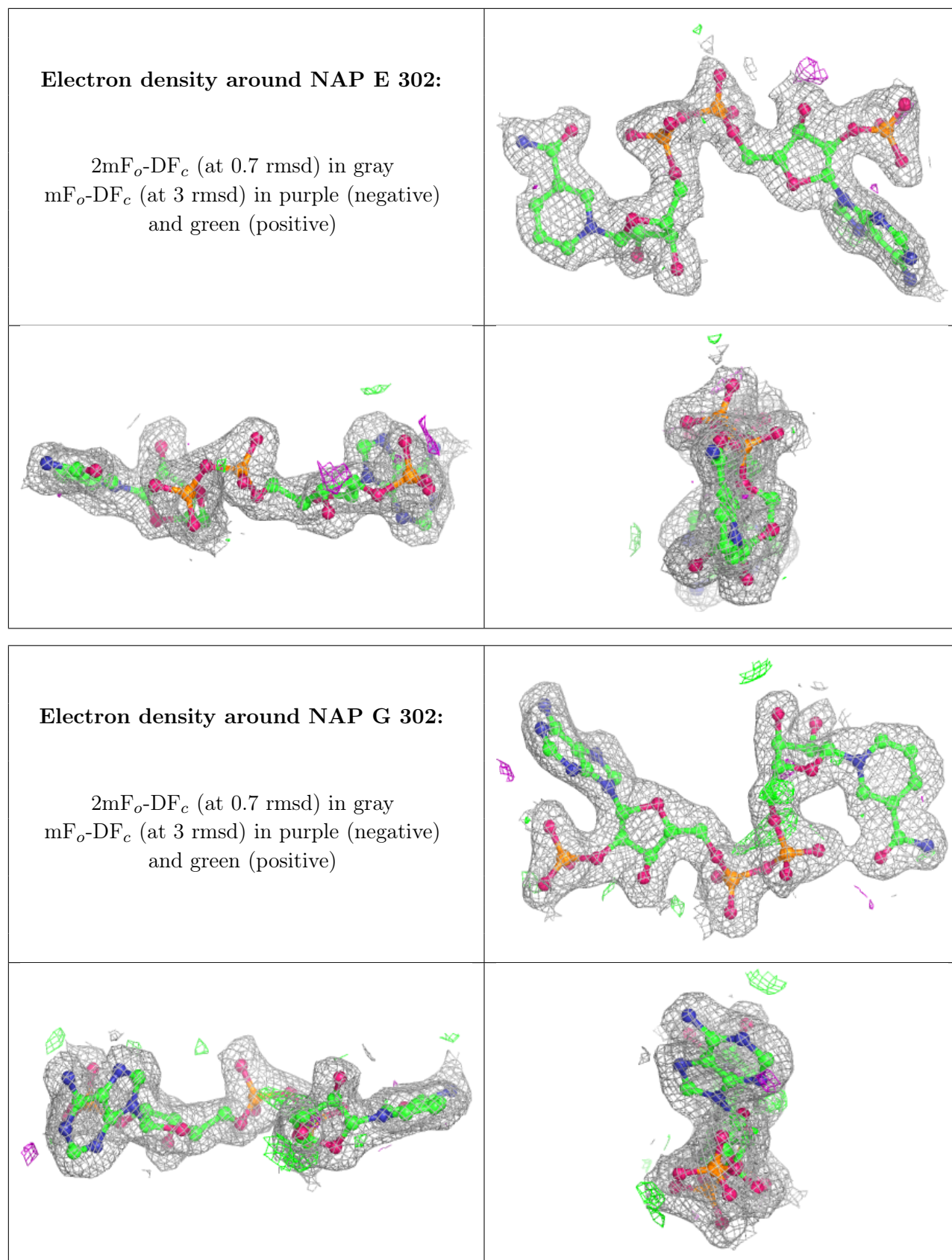
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and green (positive)

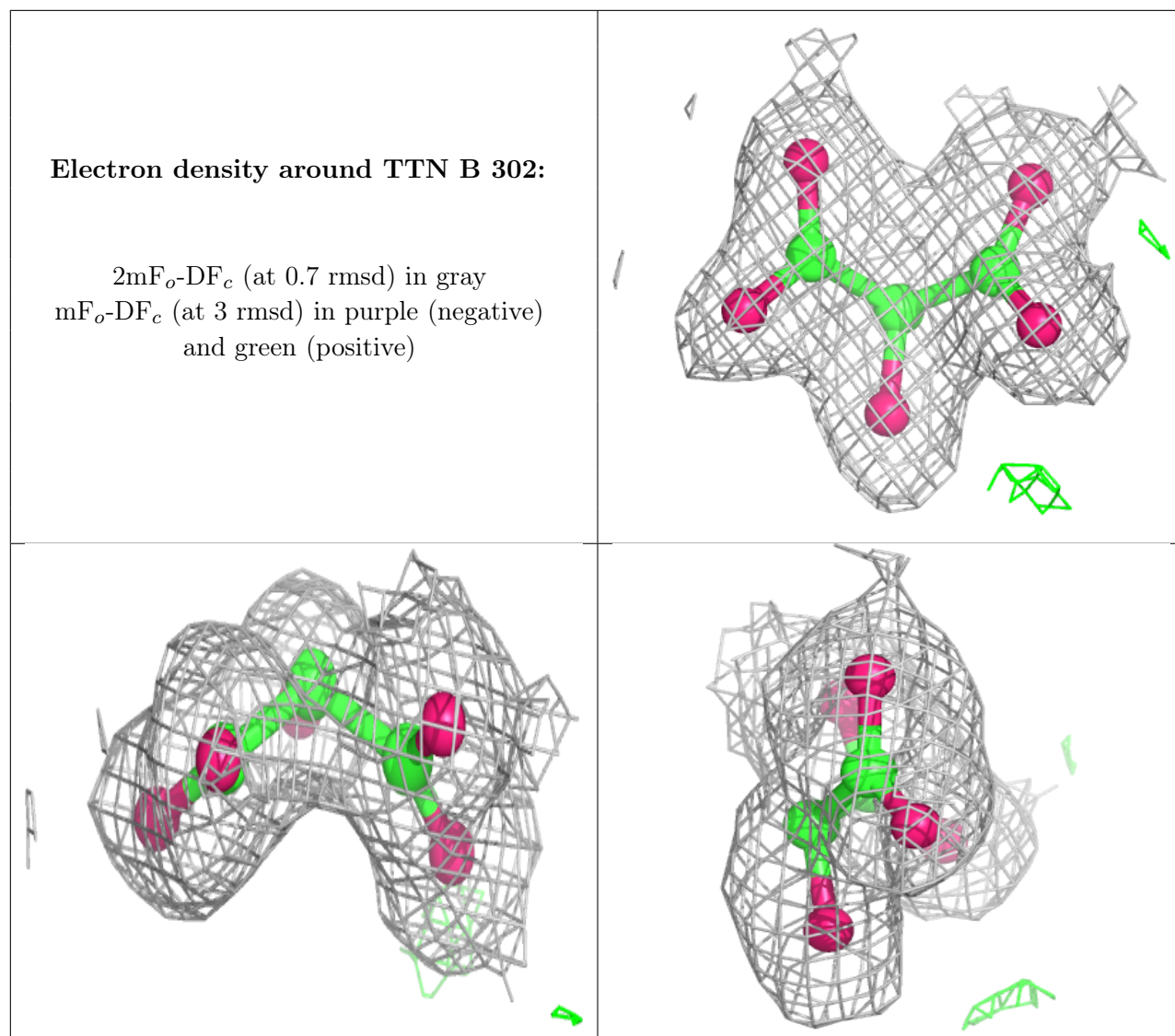


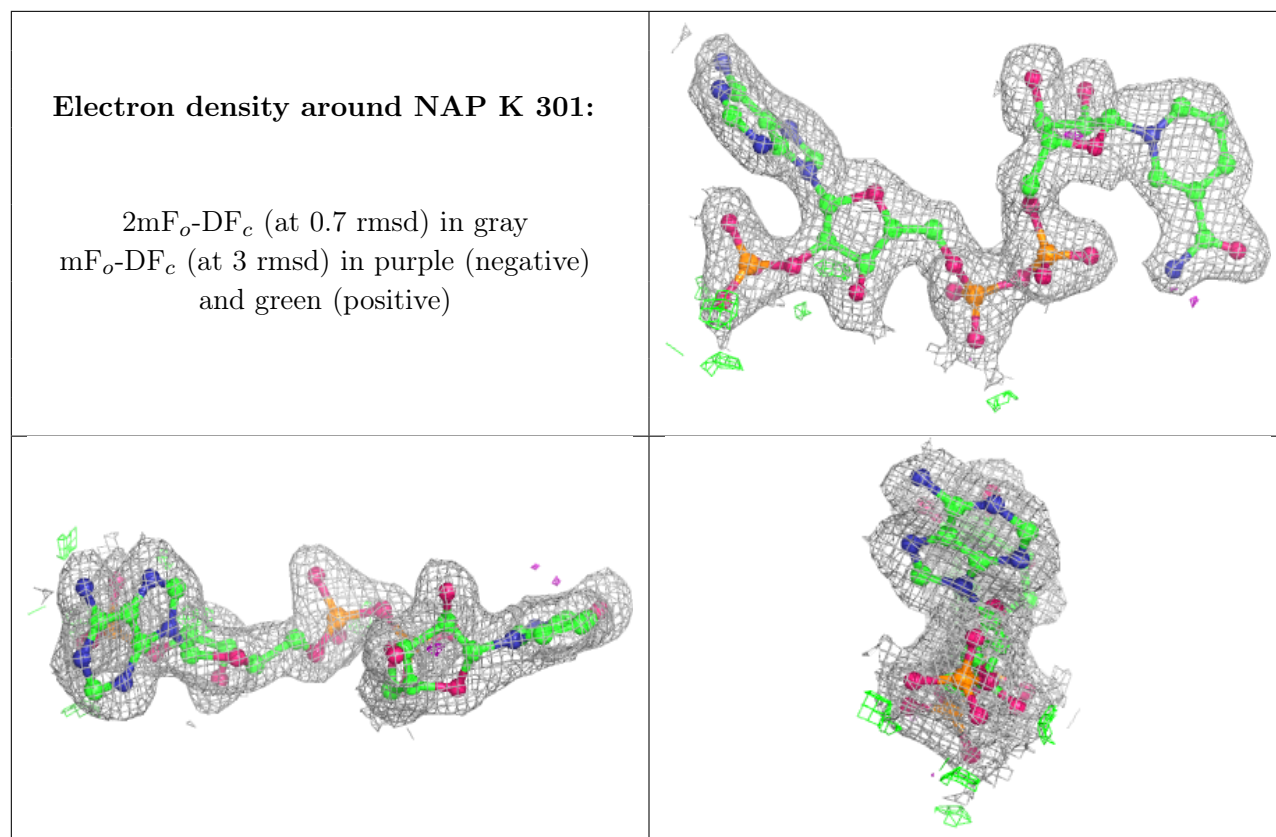
**Electron density around TTN F 301:**

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



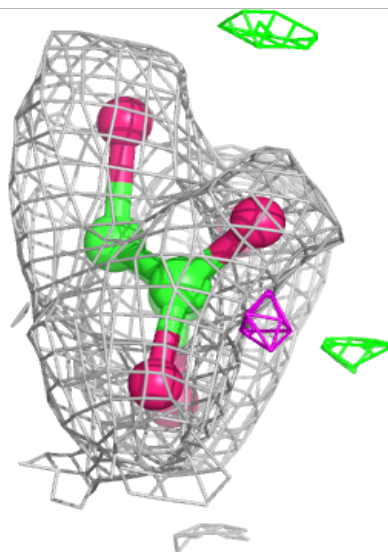
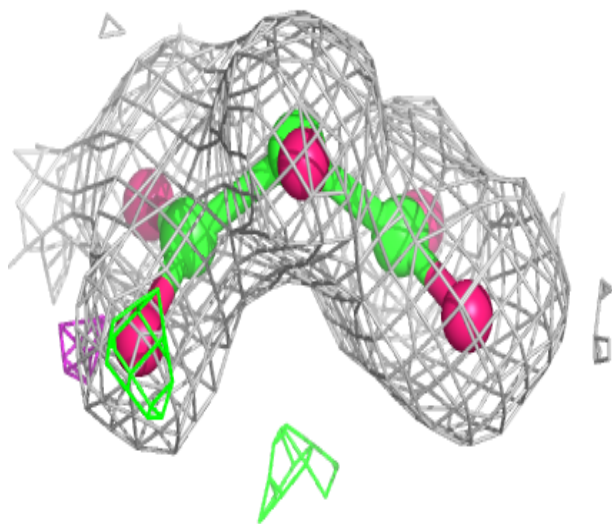
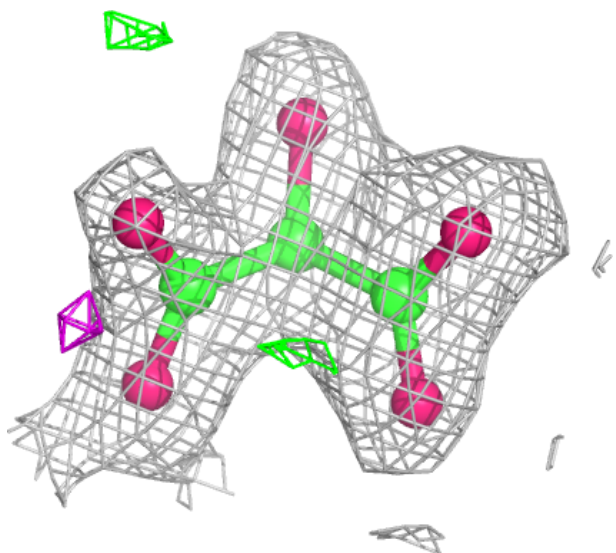






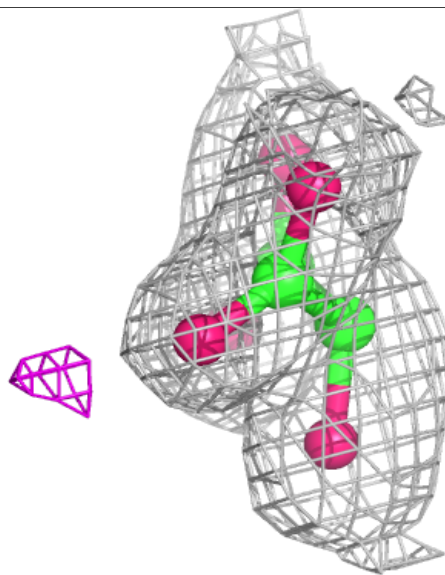
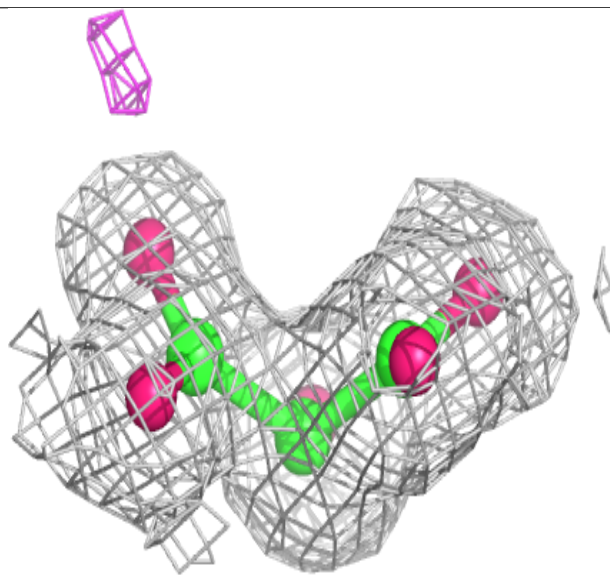
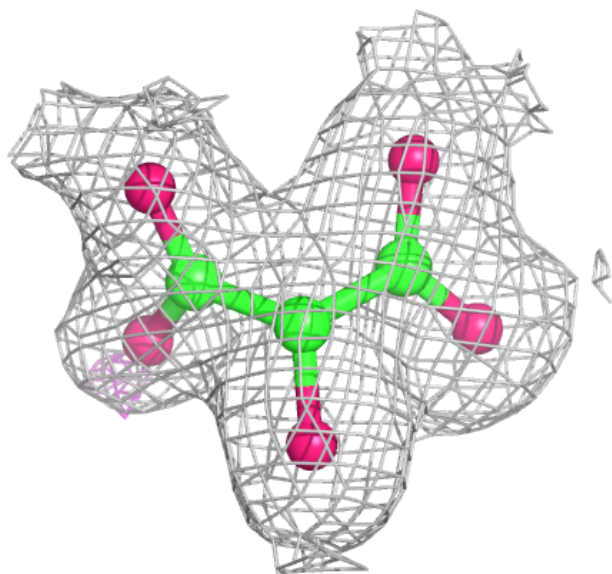
**Electron density around TTN A 302:**

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



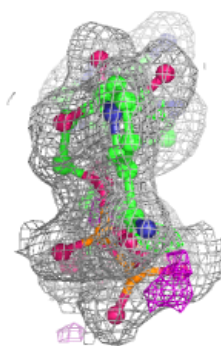
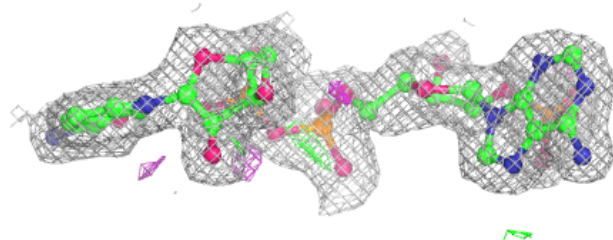
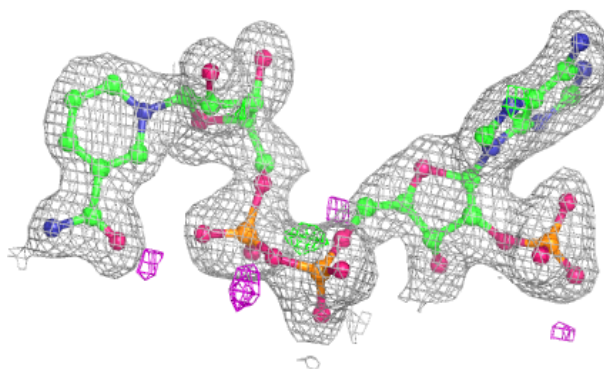
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and green (positive)

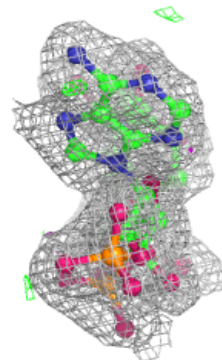
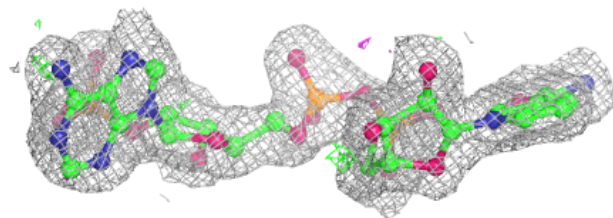
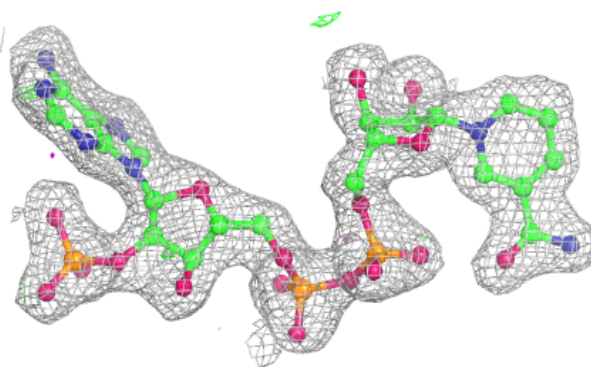


**Electron density around NAP D 302:**

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

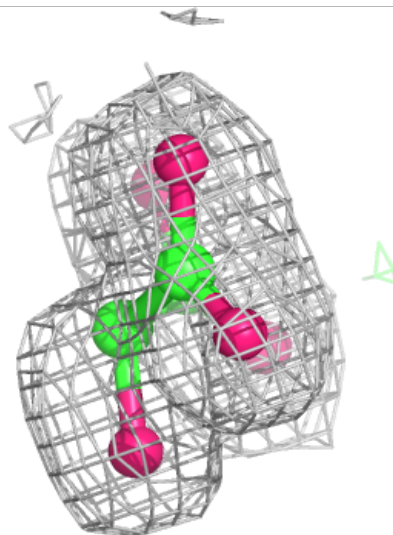
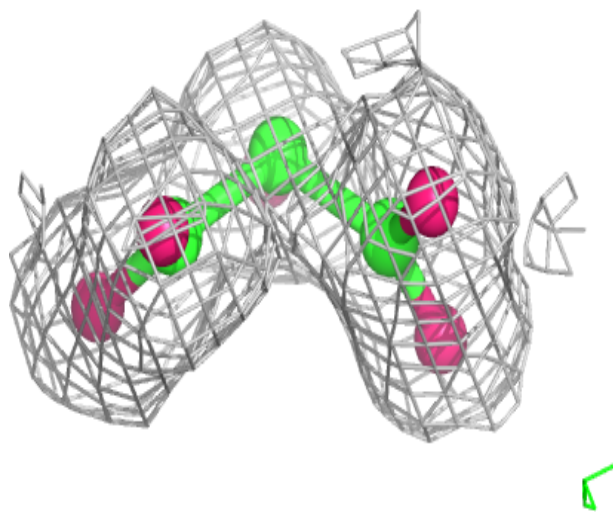
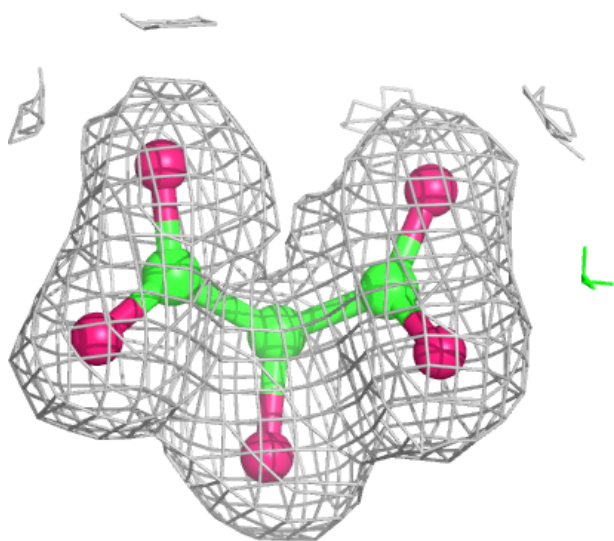
**Electron density around NAP I 301:**

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and green (positive)



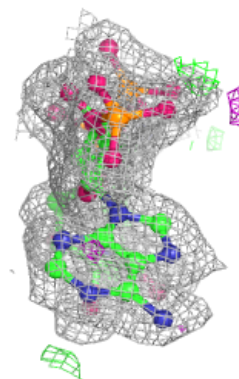
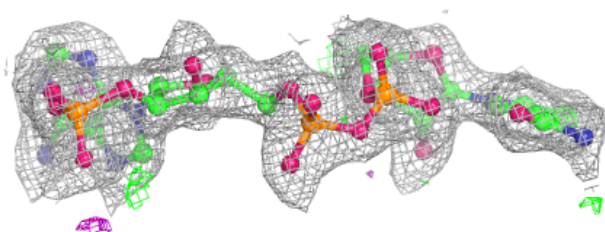
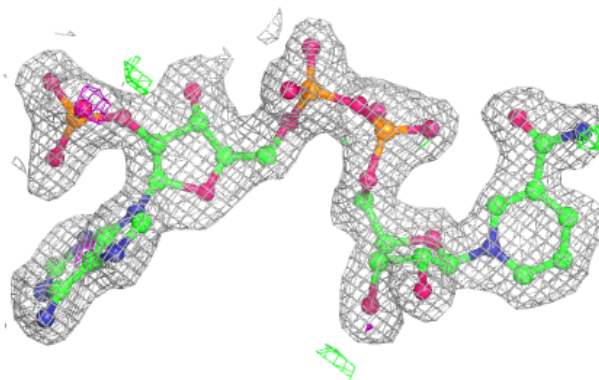
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and green (positive)

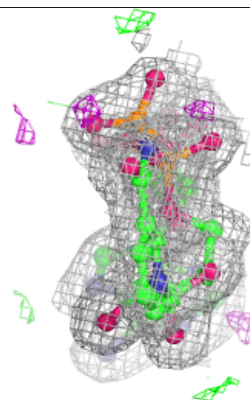
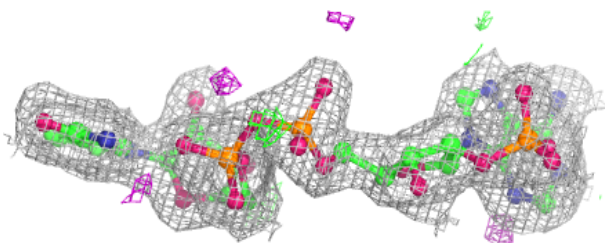
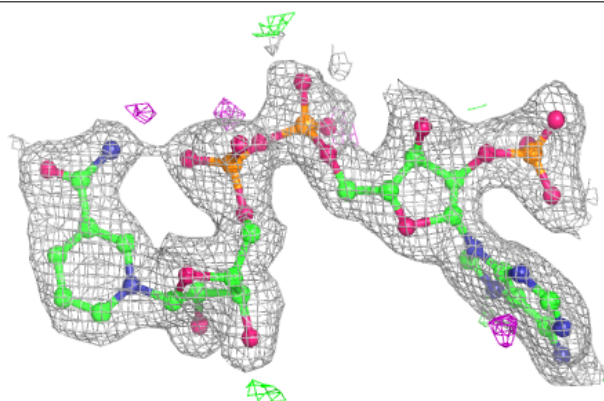


**Electron density around NAP A 301:**

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and green (positive)

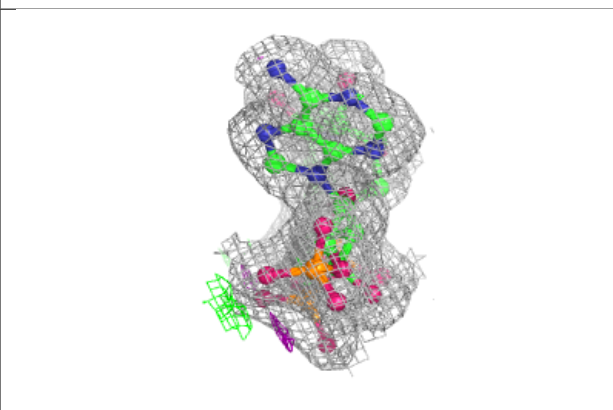
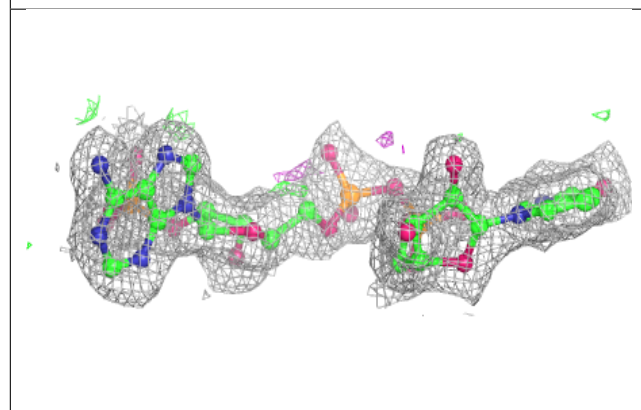
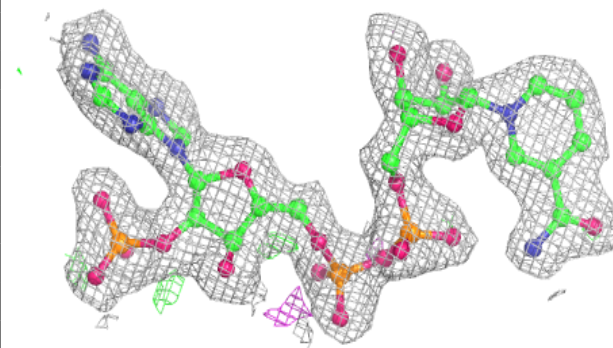
**Electron density around NAP J 301:**

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and green (positive)

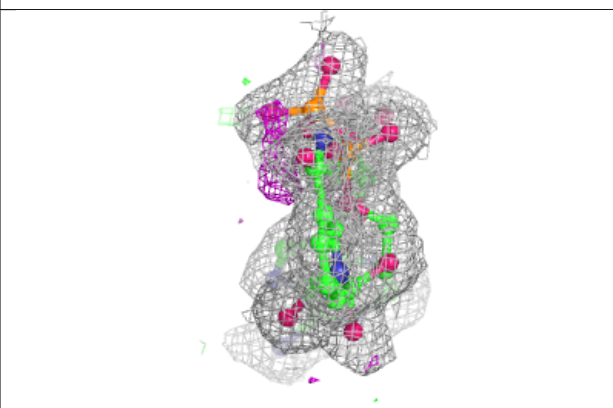
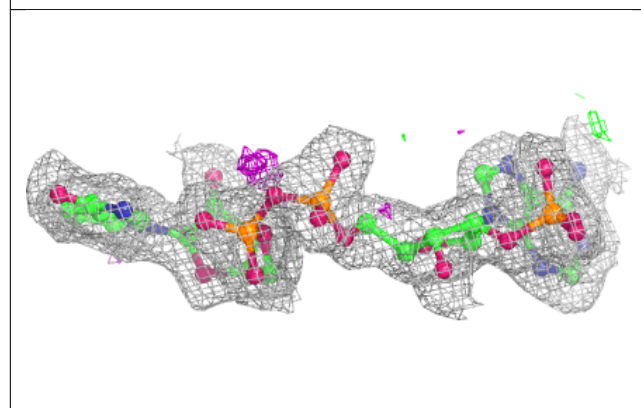
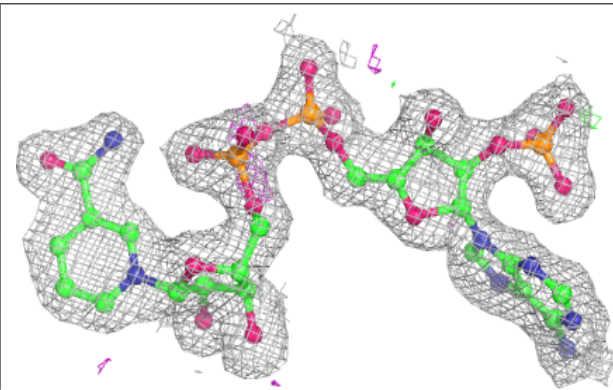


**Electron density around NAP B 301:**

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and green (positive)

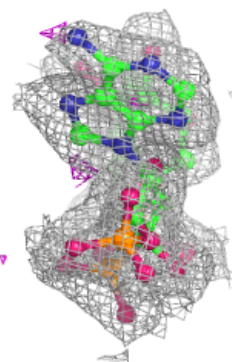
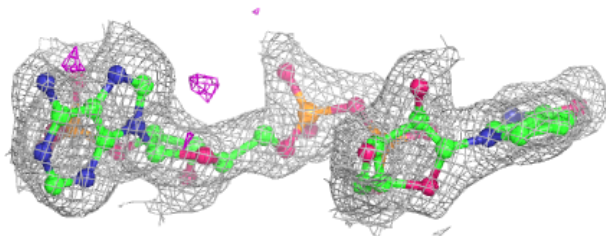
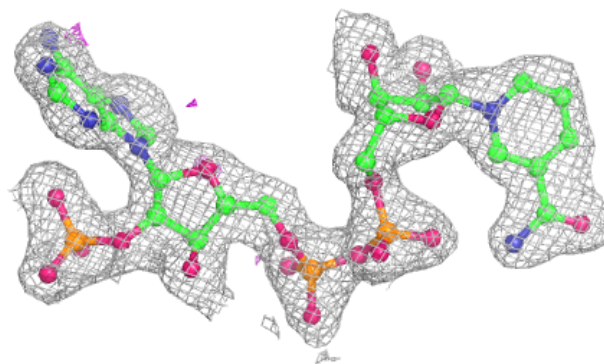
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and green (positive)

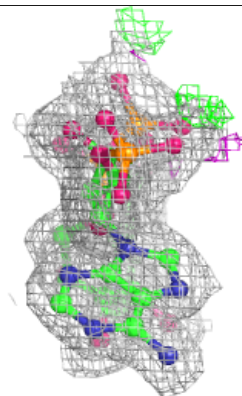
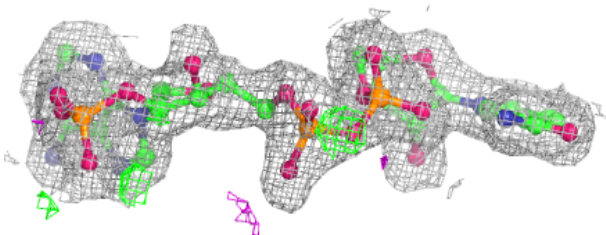
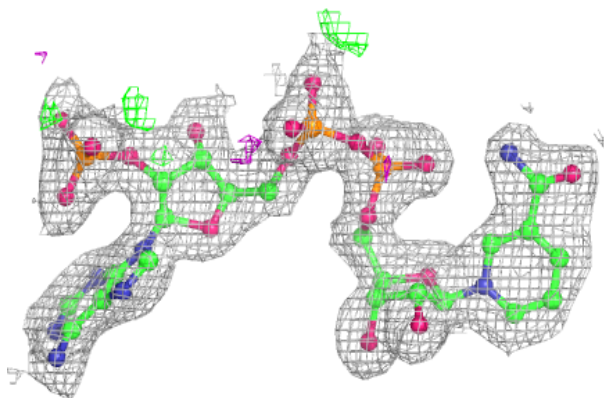


**Electron density around NAP F 302:**

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

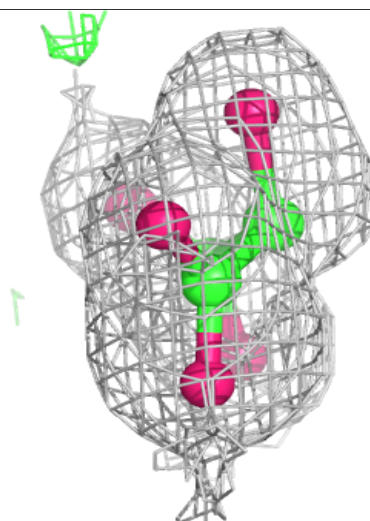
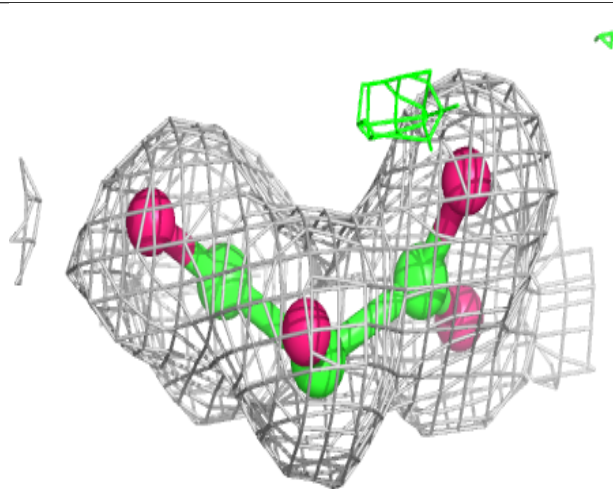
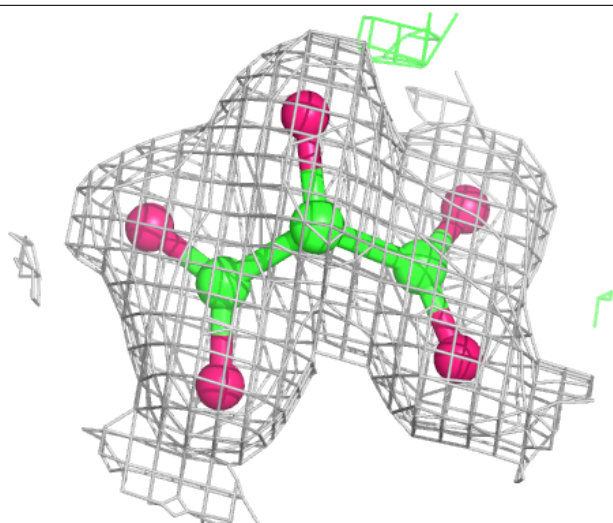
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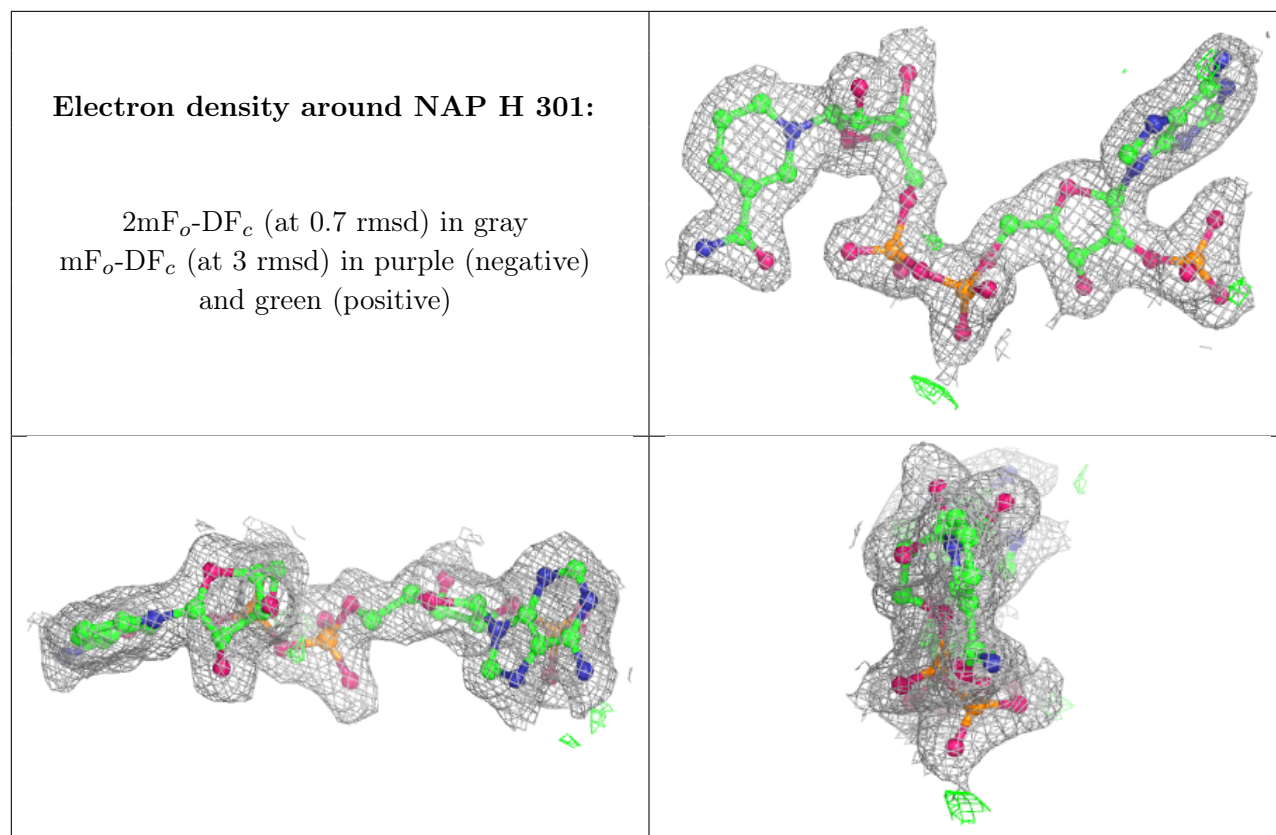
$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)

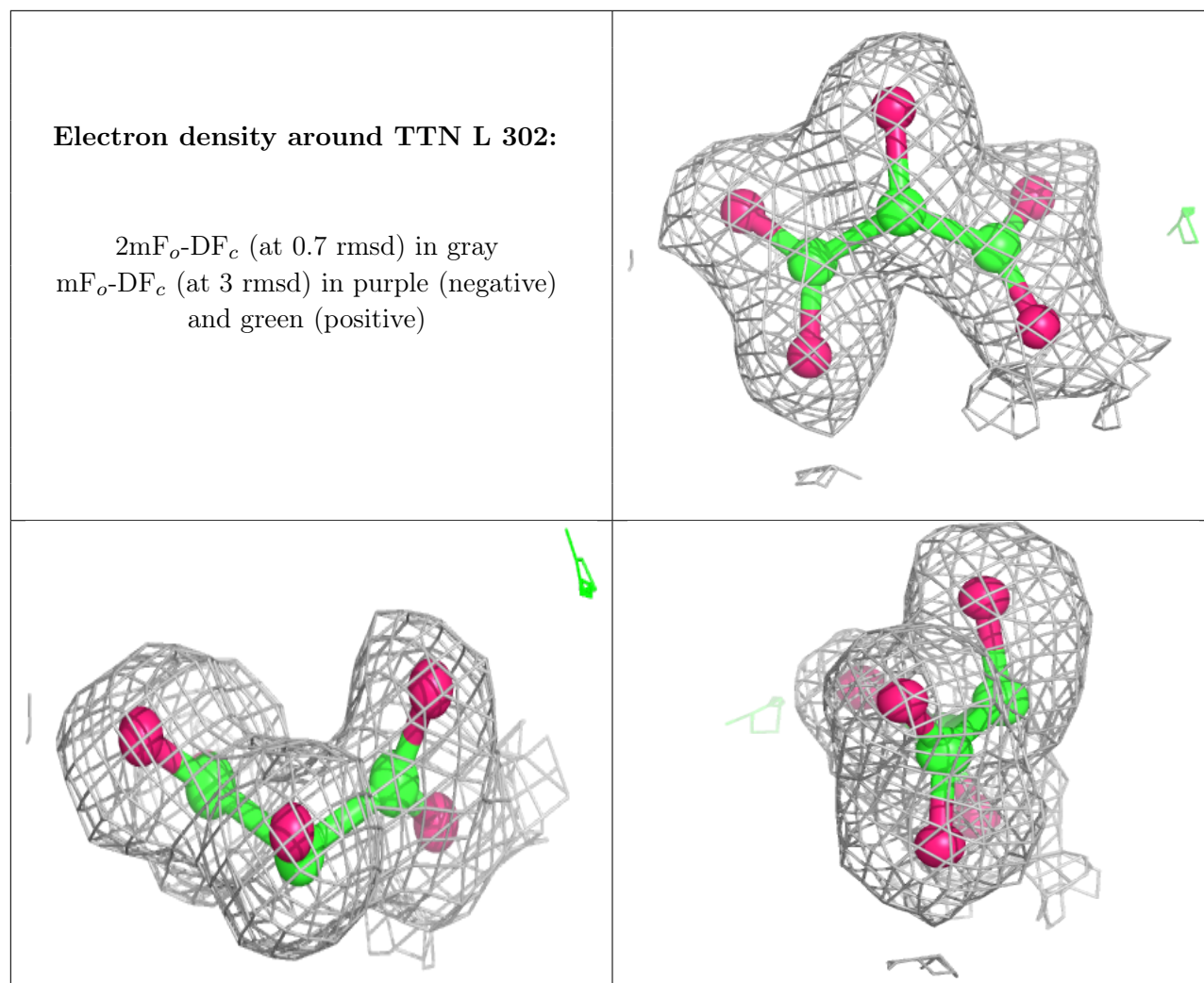


**Electron density around TTN J 302:**

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







## 6.5 Other polymers [\(i\)](#)

There are no such residues in this entry.