



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 24, 2026 – 06:30 PM UTC

PDB ID : 6IXJ / pdb_00006ixj
Title : The crystal structure of sulfoacetaldehyde reductase from *Klebsiella oxytoca*
Authors : Zhou, Y.; Xu, T.; Lin, L.; Zhang, Y.; Yuchi, Z.
Deposited on : 2018-12-10
Resolution : 2.80 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

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 : 4-5-2 with Phenix2.0
Mogul : 2022.3.0, CSD as543be (2022)
Xtriage (Phenix) : 2.0
EDS : 3.0
Buster-report : wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4 : 9.0.010 (Gargrove)
Density-Fitness : 1.0.12
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

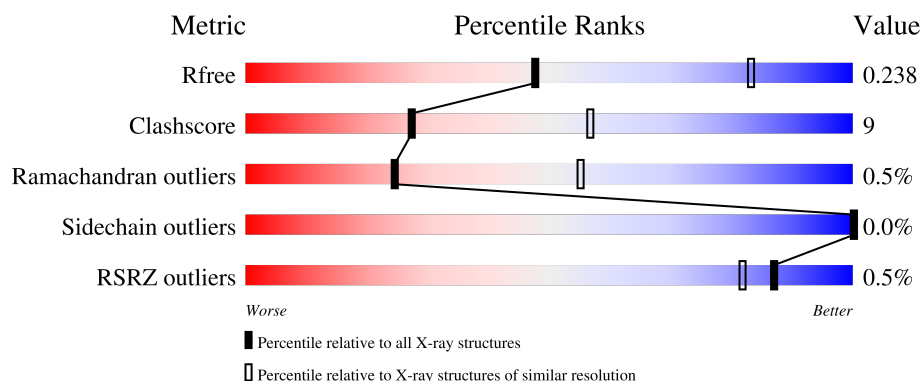
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.80 Å.

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



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	180053	3866 (2.80-2.80)
Clashscore	190562	4276 (2.80-2.80)
Ramachandran outliers	187476	4196 (2.80-2.80)
Sidechain outliers	187428	4198 (2.80-2.80)
RSRZ outliers	180081	3869 (2.80-2.80)

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 ≥ 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	256	 84% 14% .
1	B	256	 84% 14% .
1	C	256	 80% 17% .
1	D	256	 82% 16% ..
1	E	256	 83% 15% .

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Mol	Chain	Length	Quality of chain
1	F	256	80%18%
1	G	256	77%20%
1	H	256	% 77%21%
1	I	256	77%21%
1	J	256	77%21%
1	K	256	% 77%21%
1	L	256	2% 78%20%

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 23331 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 Sulfoacetaldehyde reductase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	251	Total	C	N	O	S	0	0	0
			1899	1203	329	362	5			
1	B	251	Total	C	N	O	S	0	0	0
			1892	1200	329	358	5			
1	C	250	Total	C	N	O	S	0	0	0
			1891	1199	328	359	5			
1	D	251	Total	C	N	O	S	0	0	0
			1876	1191	324	356	5			
1	E	251	Total	C	N	O	S	0	0	0
			1878	1193	324	356	5			
1	F	251	Total	C	N	O	S	0	0	0
			1878	1189	328	356	5			
1	G	251	Total	C	N	O	S	0	0	0
			1869	1183	326	355	5			
1	H	251	Total	C	N	O	S	0	0	0
			1871	1187	326	353	5			
1	I	251	Total	C	N	O	S	0	0	0
			1855	1182	320	348	5			
1	J	251	Total	C	N	O	S	0	0	0
			1861	1184	322	350	5			
1	K	251	Total	C	N	O	S	0	0	0
			1822	1156	318	343	5			
1	L	251	Total	C	N	O	S	0	0	0
			1812	1148	318	341	5			

There are 24 discrepancies between the modelled and reference sequences:

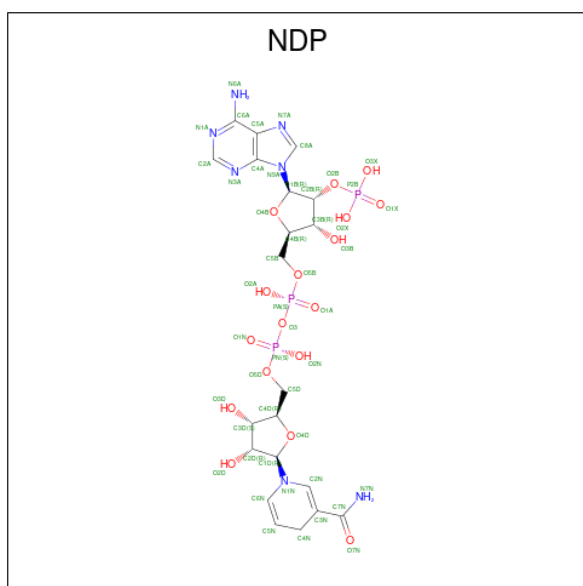
Chain	Residue	Modelled	Actual	Comment	Reference
A	-1	SER	-	expression tag	UNP D3U1D9
A	0	ASN	-	expression tag	UNP D3U1D9
B	-1	SER	-	expression tag	UNP D3U1D9
B	0	ASN	-	expression tag	UNP D3U1D9
C	-1	SER	-	expression tag	UNP D3U1D9

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Chain	Residue	Modelled	Actual	Comment	Reference
C	0	ASN	-	expression tag	UNP D3U1D9
D	-1	SER	-	expression tag	UNP D3U1D9
D	0	ASN	-	expression tag	UNP D3U1D9
E	-1	SER	-	expression tag	UNP D3U1D9
E	0	ASN	-	expression tag	UNP D3U1D9
F	-1	SER	-	expression tag	UNP D3U1D9
F	0	ASN	-	expression tag	UNP D3U1D9
G	-1	SER	-	expression tag	UNP D3U1D9
G	0	ASN	-	expression tag	UNP D3U1D9
H	-1	SER	-	expression tag	UNP D3U1D9
H	0	ASN	-	expression tag	UNP D3U1D9
I	-1	SER	-	expression tag	UNP D3U1D9
I	0	ASN	-	expression tag	UNP D3U1D9
J	-1	SER	-	expression tag	UNP D3U1D9
J	0	ASN	-	expression tag	UNP D3U1D9
K	-1	SER	-	expression tag	UNP D3U1D9
K	0	ASN	-	expression tag	UNP D3U1D9
L	-1	SER	-	expression tag	UNP D3U1D9
L	0	ASN	-	expression tag	UNP D3U1D9

- Molecule 2 is NADPH DIHYDRO-NICOTINAMIDE-ADENINE-DINUCLEOTIDE PHOSPHATE (CCD ID: NDP) (formula: $C_{21}H_{30}N_7O_{17}P_3$) (labeled as "Ligand of Interest" by depositor).



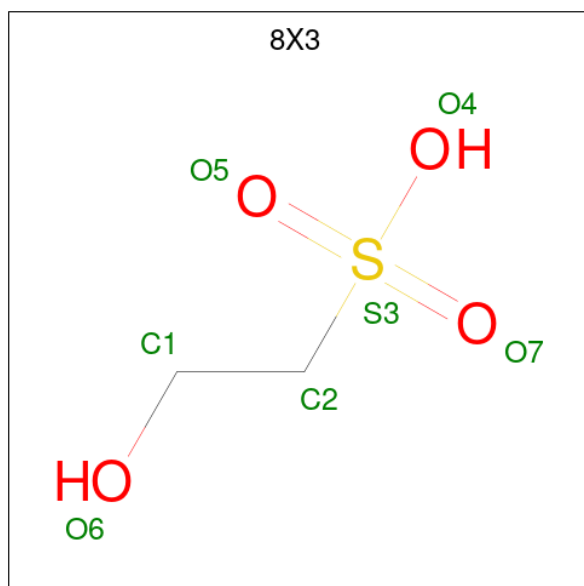
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	A	1	Total	C	N	O	P	0
			48	21	7	17	3	

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Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	B	1	Total	C	N	O	P	0	0
			48	21	7	17	3		
2	C	1	Total	C	N	O	P	0	0
			48	21	7	17	3		
2	D	1	Total	C	N	O	P	0	0
			48	21	7	17	3		
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 2-hydroxyethylsulfonic acid (CCD ID: 8X3) (formula: C₂H₆O₄S) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	1	Total C O S 7 2 4 1	0	0
3	B	1	Total C O S 7 2 4 1	0	0
3	C	1	Total C O S 7 2 4 1	0	0
3	D	1	Total C O S 7 2 4 1	0	0
3	E	1	Total C O S 7 2 4 1	0	0
3	F	1	Total C O S 7 2 4 1	0	0
3	G	1	Total C O S 7 2 4 1	0	0
3	H	1	Total C O S 7 2 4 1	0	0
3	I	1	Total C O S 7 2 4 1	0	0
3	J	1	Total C O S 7 2 4 1	0	0
3	K	1	Total C O S 7 2 4 1	0	0
3	L	1	Total C O S 7 2 4 1	0	0

- Molecule 4 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	33	Total O 33 33	0	0
4	B	38	Total O 38 38	0	0
4	C	34	Total O 34 34	0	0
4	D	25	Total O 25 25	0	0
4	E	28	Total O 28 28	0	0
4	F	22	Total O 22 22	0	0
4	G	21	Total O 21 21	0	0
4	H	12	Total O 12 12	0	0

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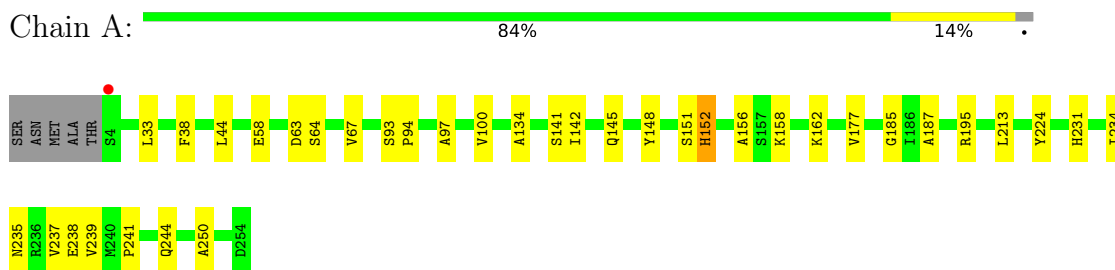
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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	I	22	Total 22	O 22	0	0
4	J	14	Total 14	O 14	0	0
4	K	8	Total 8	O 8	0	0
4	L	10	Total 10	O 10	0	0

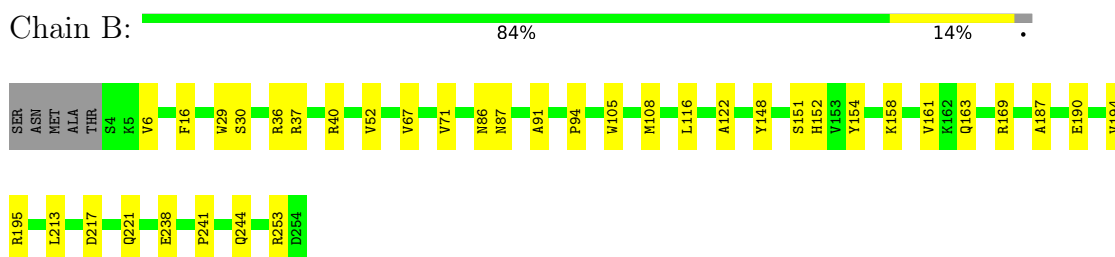
3 Residue-property plots [i](#)

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.

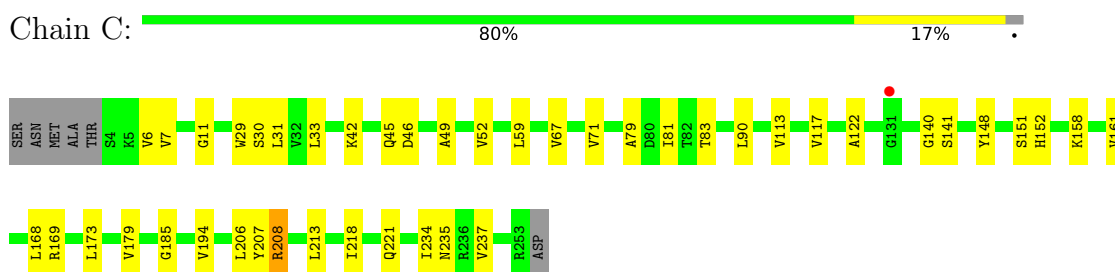
• Molecule 1: Sulfoacetaldehyde reductase



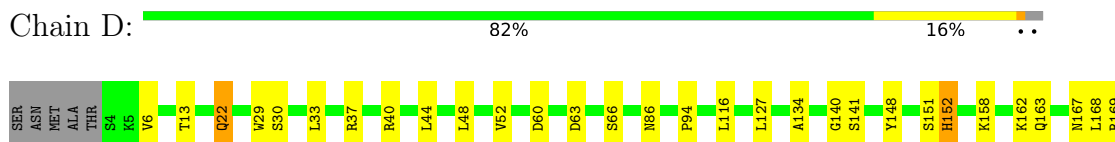
• Molecule 1: Sulfoacetaldehyde reductase



• Molecule 1: Sulfoacetaldehyde reductase



• Molecule 1: Sulfoacetaldehyde reductase





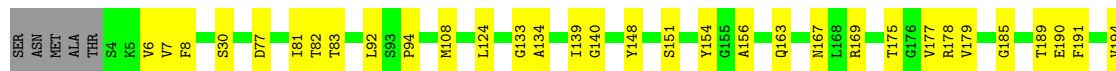
- Molecule 1: Sulfoacetaldehyde reductase

Chain E: 83% 15% .



- Molecule 1: Sulfoacetaldehyde reductase

Chain F: 80% 18% .



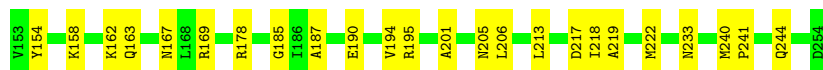
- Molecule 1: Sulfoacetaldehyde reductase

Chain G: 77% 20% .



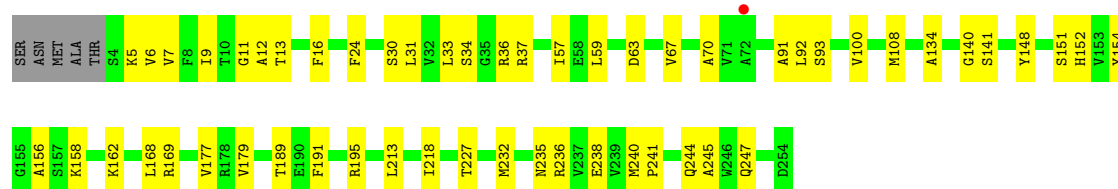
- Molecule 1: Sulfoacetaldehyde reductase

Chain H: 77% 21% .



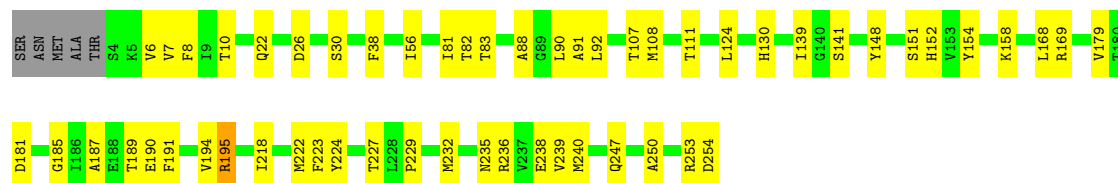
- Molecule 1: Sulfoacetaldehyde reductase

Chain I: 77% 21% .



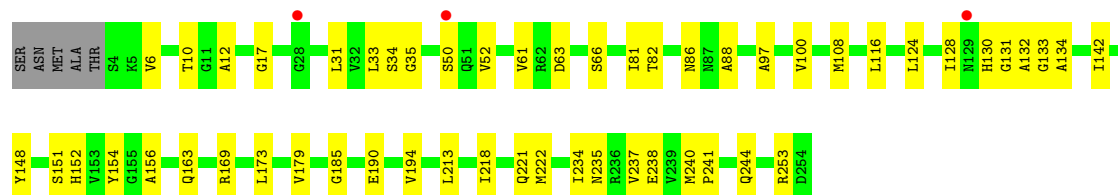
• Molecule 1: Sulfoacetaldehyde reductase

Chain J: 77% 21%



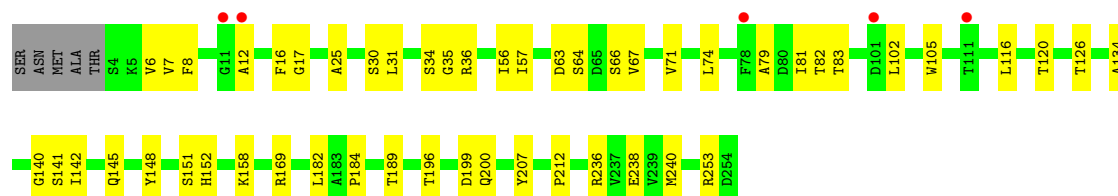
• Molecule 1: Sulfoacetaldehyde reductase

Chain K: 77% 21%



• Molecule 1: Sulfoacetaldehyde reductase

Chain L: 78% 20%



4 Data and refinement statistics

Property	Value	Source
Space group	P 32	Depositor
Cell constants a, b, c, α , β , γ	125.86Å 125.86Å 173.92Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	37.23 – 2.80 37.23 – 2.80	Depositor EDS
% Data completeness (in resolution range)	99.9 (37.23-2.80) 94.7 (37.23-2.80)	Depositor EDS
R_{merge}	0.15	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.03 (at 2.81Å)	Xtriage
Refinement program	PHENIX 1.14_3247	Depositor
R, R_{free}	0.194 , 0.240 0.195 , 0.238	Depositor DCC
R_{free} test set	2007 reflections (2.64%)	wwPDB-VP
Wilson B-factor (Å ²)	39.4	Xtriage
Anisotropy	0.440	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 34.5	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	0.016 for -h,-k,l 0.036 for h,-h-k,-l 0.025 for -k,-h,-l	Xtriage
F_o, F_c correlation	0.93	EDS
Total number of atoms	23331	wwPDB-VP
Average B, all atoms (Å ²)	43.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.24% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical 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: 8X3, NDP

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	0.14	0/1938	0.35	0/2646
1	B	0.17	0/1931	0.36	0/2637
1	C	0.19	0/1930	0.46	1/2635 (0.0%)
1	D	0.14	0/1915	0.39	1/2618 (0.0%)
1	E	0.17	0/1917	0.38	0/2621
1	F	0.13	0/1916	0.34	0/2619
1	G	0.21	0/1907	0.53	2/2606 (0.1%)
1	H	0.20	0/1910	0.42	0/2611
1	I	0.16	0/1894	0.38	0/2592
1	J	0.28	2/1900 (0.1%)	0.43	2/2600 (0.1%)
1	K	0.16	0/1860	0.38	0/2550
1	L	0.16	0/1850	0.41	0/2537
All	All	0.18	2/22868 (0.0%)	0.41	6/31272 (0.0%)

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	J	195	ARG	CG-CD	6.60	1.72	1.52
1	J	195	ARG	CD-NE	5.56	1.54	1.46

The worst 5 of 6 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	G	102	LEU	CB-CG-CD2	-8.69	84.63	110.70
1	C	208	ARG	CB-CG-CD	-7.33	94.44	111.30
1	D	22	GLN	CA-CB-CG	-6.75	100.61	114.10
1	J	195	ARG	NE-CZ-NH2	6.37	124.93	119.20
1	G	102	LEU	CB-CG-CD1	6.12	129.06	110.70

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	1899	0	1882	27	0
1	B	1892	0	1876	28	0
1	C	1891	0	1877	40	1
1	D	1876	0	1836	33	0
1	E	1878	0	1847	32	0
1	F	1878	0	1853	33	1
1	G	1869	0	1829	38	0
1	H	1871	0	1836	43	0
1	I	1855	0	1821	50	0
1	J	1861	0	1824	63	0
1	K	1822	0	1747	39	0
1	L	1812	0	1717	36	0
2	A	48	0	26	2	0
2	B	48	0	26	2	0
2	C	48	0	26	4	0
2	D	48	0	26	7	0
2	E	48	0	26	6	0
2	F	48	0	25	3	0
2	G	48	0	26	3	0
2	H	48	0	25	4	0
2	I	48	0	26	7	0
2	J	48	0	26	3	0
2	K	48	0	25	2	0
2	L	48	0	26	4	0
3	A	7	0	0	1	0
3	B	7	0	0	1	0
3	C	7	0	0	1	0
3	D	7	0	0	0	0
3	E	7	0	0	1	0
3	F	7	0	0	0	0
3	G	7	0	0	1	0
3	H	7	0	0	1	0
3	I	7	0	0	0	0
3	J	7	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	K	7	0	0	0	0
3	L	7	0	0	2	0
4	A	33	0	0	1	0
4	B	38	0	0	4	0
4	C	34	0	0	0	0
4	D	25	0	0	0	0
4	E	28	0	0	0	0
4	F	22	0	0	1	0
4	G	21	0	0	5	0
4	H	12	0	0	0	0
4	I	22	0	0	3	0
4	J	14	0	0	0	0
4	K	8	0	0	1	0
4	L	10	0	0	3	0
All	All	23331	0	22254	412	1

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 9.

The worst 5 of 412 close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:208:ARG:NH1	1:J:253:ARG:NE	1.63	1.47
1:C:208:ARG:HH22	1:J:253:ARG:NH1	1.22	1.38
1:C:208:ARG:NH1	1:J:253:ARG:CD	1.84	1.36
1:C:208:ARG:HH22	1:J:253:ARG:CZ	1.48	1.26
1:C:208:ARG:NH2	1:J:253:ARG:CZ	2.16	1.08

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

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:221:GLN:OE1	1:F:224:TYR:OH[3_555]	2.19	0.01

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	249/256 (97%)	240 (96%)	8 (3%)	1 (0%)	30	60
1	B	249/256 (97%)	239 (96%)	10 (4%)	0	100	100
1	C	248/256 (97%)	236 (95%)	9 (4%)	3 (1%)	10	34
1	D	249/256 (97%)	239 (96%)	9 (4%)	1 (0%)	30	60
1	E	249/256 (97%)	239 (96%)	9 (4%)	1 (0%)	30	60
1	F	249/256 (97%)	239 (96%)	10 (4%)	0	100	100
1	G	249/256 (97%)	239 (96%)	7 (3%)	3 (1%)	10	34
1	H	249/256 (97%)	238 (96%)	9 (4%)	2 (1%)	16	44
1	I	249/256 (97%)	240 (96%)	8 (3%)	1 (0%)	30	60
1	J	249/256 (97%)	238 (96%)	10 (4%)	1 (0%)	30	60
1	K	249/256 (97%)	239 (96%)	9 (4%)	1 (0%)	30	60
1	L	249/256 (97%)	240 (96%)	8 (3%)	1 (0%)	30	60
All	All	2987/3072 (97%)	2866 (96%)	106 (4%)	15 (0%)	24	55

5 of 15 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	152	HIS
1	C	152	HIS
1	D	152	HIS
1	E	152	HIS
1	G	79	ALA

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	200/205 (98%)	200 (100%)	0	100	100
1	B	198/205 (97%)	198 (100%)	0	100	100
1	C	199/205 (97%)	199 (100%)	0	100	100
1	D	193/205 (94%)	193 (100%)	0	100	100
1	E	194/205 (95%)	194 (100%)	0	100	100
1	F	195/205 (95%)	195 (100%)	0	100	100
1	G	191/205 (93%)	191 (100%)	0	100	100
1	H	192/205 (94%)	192 (100%)	0	100	100
1	I	189/205 (92%)	189 (100%)	0	100	100
1	J	190/205 (93%)	190 (100%)	0	100	100
1	K	179/205 (87%)	179 (100%)	0	100	100
1	L	174/205 (85%)	173 (99%)	1 (1%)	78	92
All	All	2294/2460 (93%)	2293 (100%)	1 (0%)	100	100

All (1) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	L	200	GLN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 26 such sidechains are listed below:

Mol	Chain	Res	Type
1	F	247	GLN
1	G	221	GLN
1	L	45	GLN
1	G	130	HIS
1	H	55	HIS

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

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	8X3	J	302	-	6,6,6	0.70	0	7,8,8	1.58	2 (28%)
3	8X3	A	302	-	6,6,6	1.35	1 (16%)	7,8,8	1.35	1 (14%)
2	NDP	H	301	-	51,52,52	2.58	9 (17%)	71,80,80	1.54	13 (18%)
3	8X3	D	302	-	6,6,6	1.47	1 (16%)	7,8,8	1.38	1 (14%)
3	8X3	L	302	-	6,6,6	1.47	1 (16%)	7,8,8	1.32	0
3	8X3	F	302	-	6,6,6	1.35	1 (16%)	7,8,8	1.42	0
2	NDP	E	301	-	51,52,52	2.63	9 (17%)	71,80,80	1.55	18 (25%)
3	8X3	C	302	-	6,6,6	1.40	1 (16%)	7,8,8	1.28	0
2	NDP	K	301	-	51,52,52	2.63	8 (15%)	71,80,80	1.59	15 (21%)
2	NDP	D	301	-	51,52,52	2.48	10 (19%)	71,80,80	1.65	20 (28%)
2	NDP	L	301	-	51,52,52	2.89	7 (13%)	71,80,80	1.89	19 (26%)
2	NDP	I	301	-	51,52,52	2.47	9 (17%)	71,80,80	1.56	15 (21%)
3	8X3	I	302	-	6,6,6	1.69	1 (16%)	7,8,8	1.26	1 (14%)
2	NDP	A	301	-	51,52,52	2.58	8 (15%)	71,80,80	1.51	13 (18%)
2	NDP	J	301	-	51,52,52	2.51	9 (17%)	71,80,80	1.52	17 (23%)
2	NDP	B	301	-	51,52,52	2.70	10 (19%)	71,80,80	1.46	12 (16%)
3	8X3	B	302	-	6,6,6	1.25	1 (16%)	7,8,8	1.33	0
3	8X3	H	302	-	6,6,6	1.60	1 (16%)	7,8,8	1.35	1 (14%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
2	NDP	F	301	-	51,52,52	2.50	10 (19%)	71,80,80	1.59	15 (21%)
3	8X3	E	302	-	6,6,6	1.63	1 (16%)	7,8,8	1.29	1 (14%)
2	NDP	G	301	-	51,52,52	2.63	10 (19%)	71,80,80	1.73	19 (26%)
3	8X3	G	302	-	6,6,6	1.49	1 (16%)	7,8,8	1.33	0
3	8X3	K	302	-	6,6,6	1.49	1 (16%)	7,8,8	1.26	1 (14%)
2	NDP	C	301	-	51,52,52	2.58	8 (15%)	71,80,80	1.58	15 (21%)

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	8X3	J	302	-	-	0/4/4/4	-
3	8X3	A	302	-	-	0/4/4/4	-
2	NDP	H	301	-	-	13/34/77/77	0/5/5/5
3	8X3	D	302	-	-	4/4/4/4	-
3	8X3	L	302	-	-	1/4/4/4	-
3	8X3	F	302	-	-	1/4/4/4	-
2	NDP	E	301	-	-	6/34/77/77	0/5/5/5
3	8X3	C	302	-	-	1/4/4/4	-
2	NDP	K	301	-	-	8/34/77/77	0/5/5/5
2	NDP	D	301	-	-	9/34/77/77	0/5/5/5
2	NDP	L	301	-	-	10/34/77/77	0/5/5/5
2	NDP	I	301	-	-	6/34/77/77	0/5/5/5
3	8X3	I	302	-	-	1/4/4/4	-
2	NDP	A	301	-	-	12/34/77/77	0/5/5/5
2	NDP	J	301	-	-	8/34/77/77	0/5/5/5
2	NDP	B	301	-	-	12/34/77/77	0/5/5/5
3	8X3	B	302	-	-	0/4/4/4	-
3	8X3	H	302	-	-	3/4/4/4	-
2	NDP	F	301	-	-	9/34/77/77	0/5/5/5
3	8X3	E	302	-	-	4/4/4/4	-
2	NDP	G	301	-	-	11/34/77/77	0/5/5/5
3	8X3	G	302	-	-	0/4/4/4	-
3	8X3	K	302	-	-	3/4/4/4	-
2	NDP	C	301	-	-	12/34/77/77	0/5/5/5

The worst 5 of 118 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	L	301	NDP	P2B-O2B	16.13	1.87	1.59
2	G	301	NDP	P2B-O2B	15.13	1.86	1.59
2	K	301	NDP	P2B-O2B	14.81	1.85	1.59
2	A	301	NDP	P2B-O2B	14.61	1.85	1.59
2	E	301	NDP	P2B-O2B	14.54	1.85	1.59

The worst 5 of 199 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	L	301	NDP	O4B-C1B-C2B	-5.80	96.60	106.59
2	B	301	NDP	P2B-O2B-C2B	-4.57	111.22	123.43
2	H	301	NDP	P2B-O2B-C2B	-4.45	111.56	123.43
2	L	301	NDP	C3B-C2B-C1B	-4.45	94.29	102.81
2	I	301	NDP	P2B-O2B-C2B	-4.43	111.60	123.43

There are no chirality outliers.

5 of 134 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	301	NDP	C5B-O5B-PA-O1A
2	A	301	NDP	PN-O3-PA-O5B
2	A	301	NDP	C5D-O5D-PN-O3
2	B	301	NDP	C5D-O5D-PN-O3
2	B	301	NDP	C5D-O5D-PN-O1N

There are no ring outliers.

19 monomers are involved in 51 short contacts:

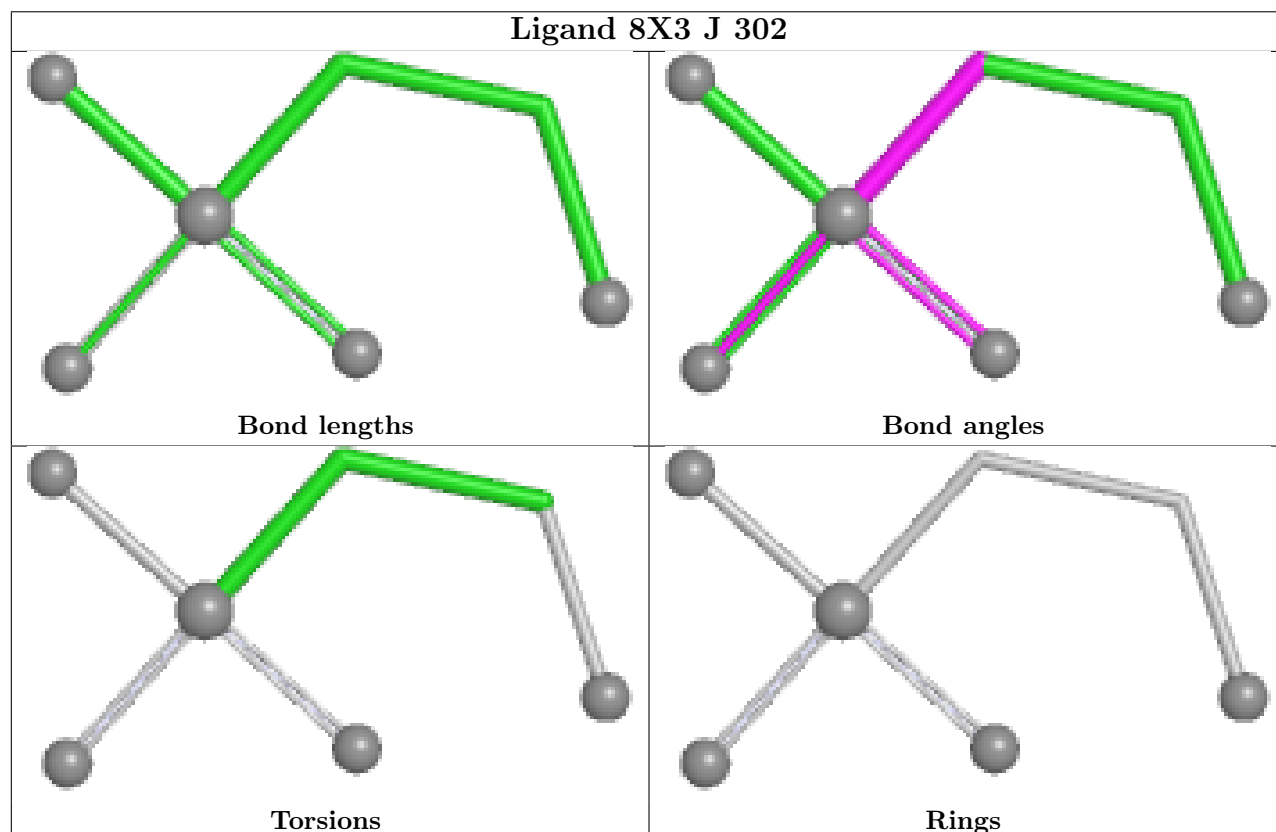
Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	302	8X3	1	0
2	H	301	NDP	4	0
3	L	302	8X3	2	0
2	E	301	NDP	6	0
3	C	302	8X3	1	0
2	K	301	NDP	2	0
2	D	301	NDP	7	0
2	L	301	NDP	4	0
2	I	301	NDP	7	0
2	A	301	NDP	2	0
2	J	301	NDP	3	0

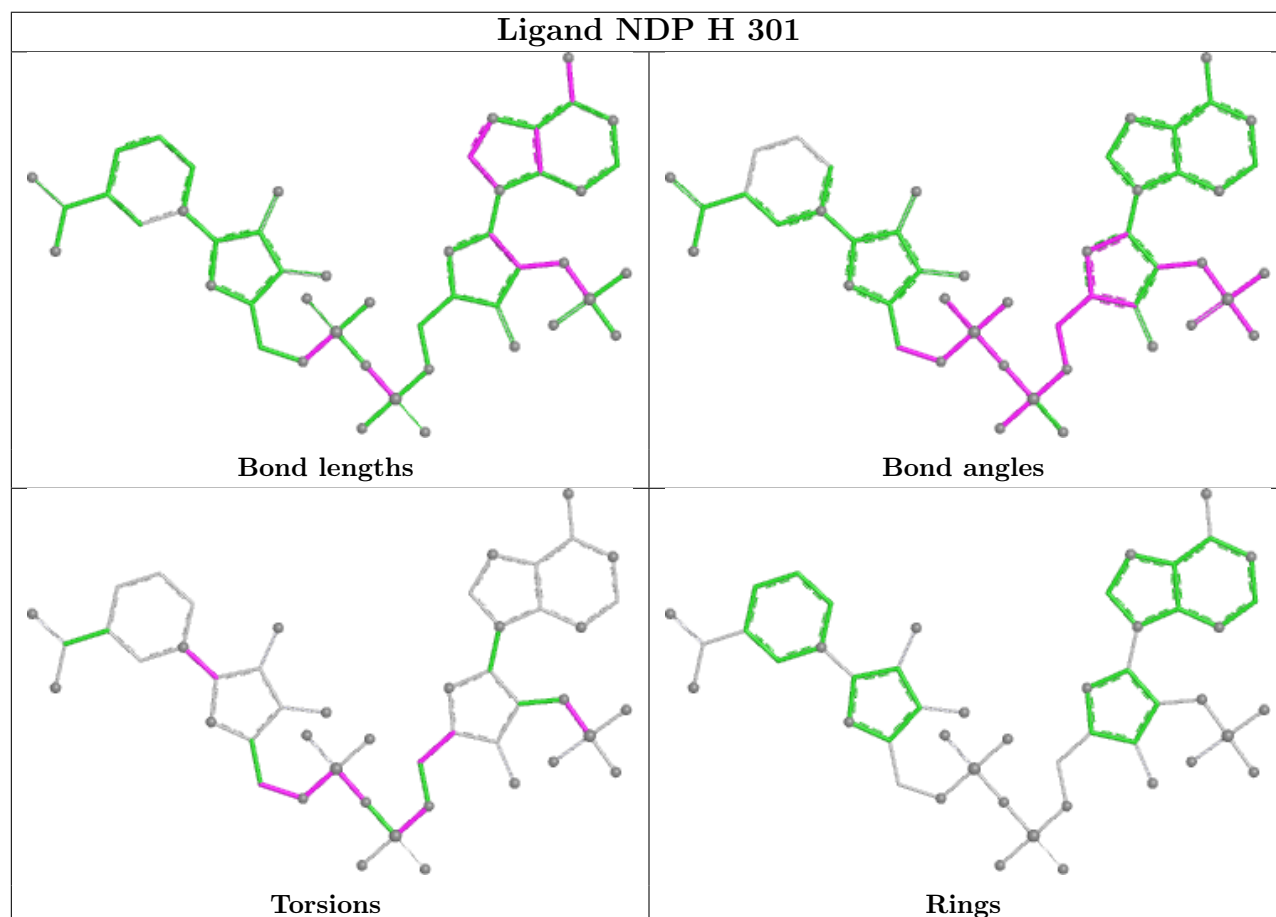
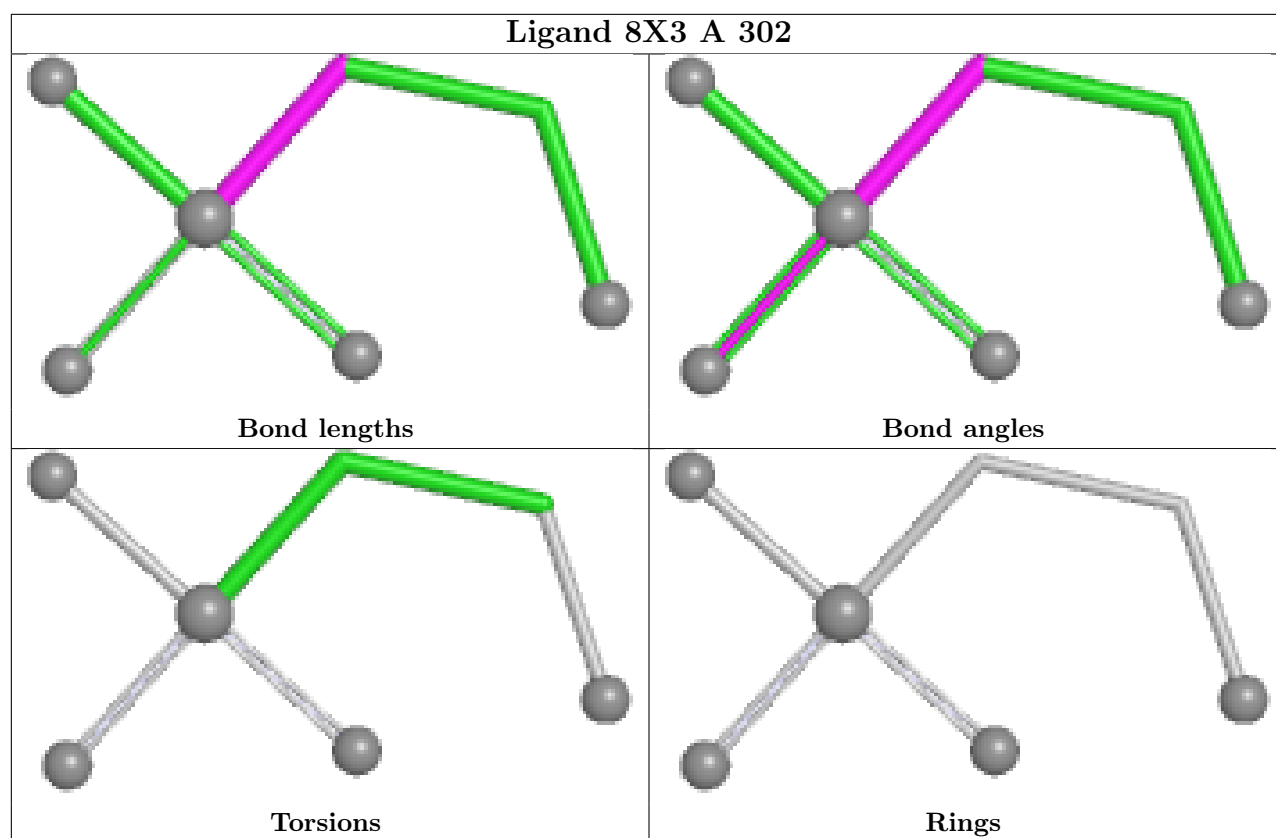
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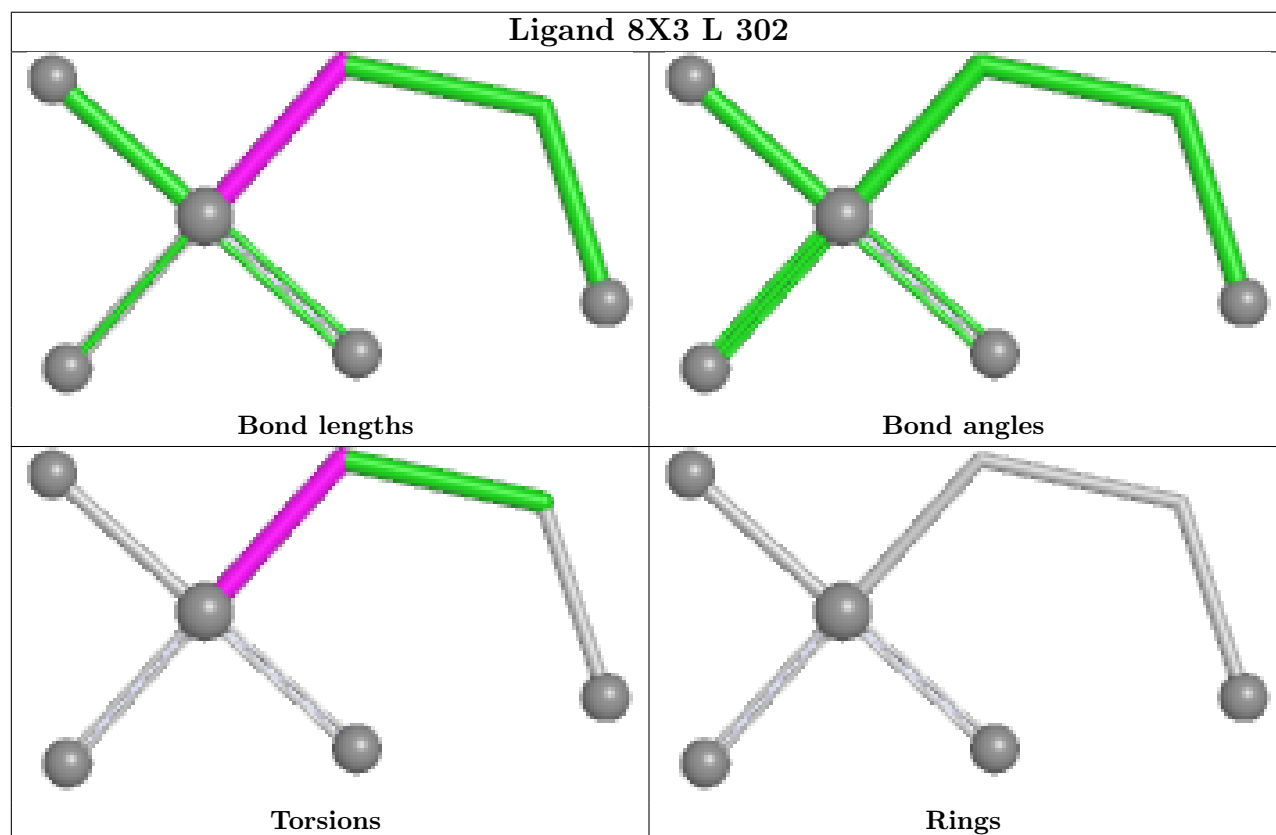
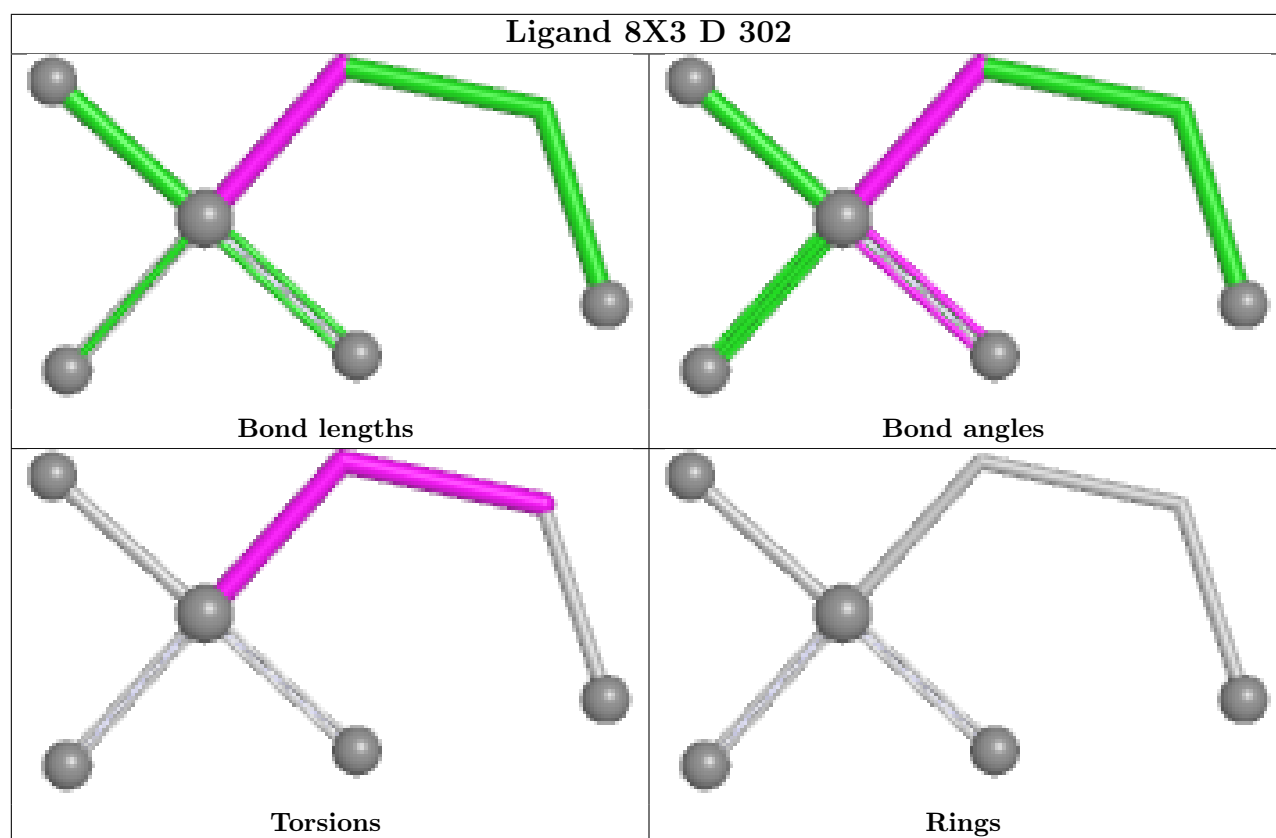
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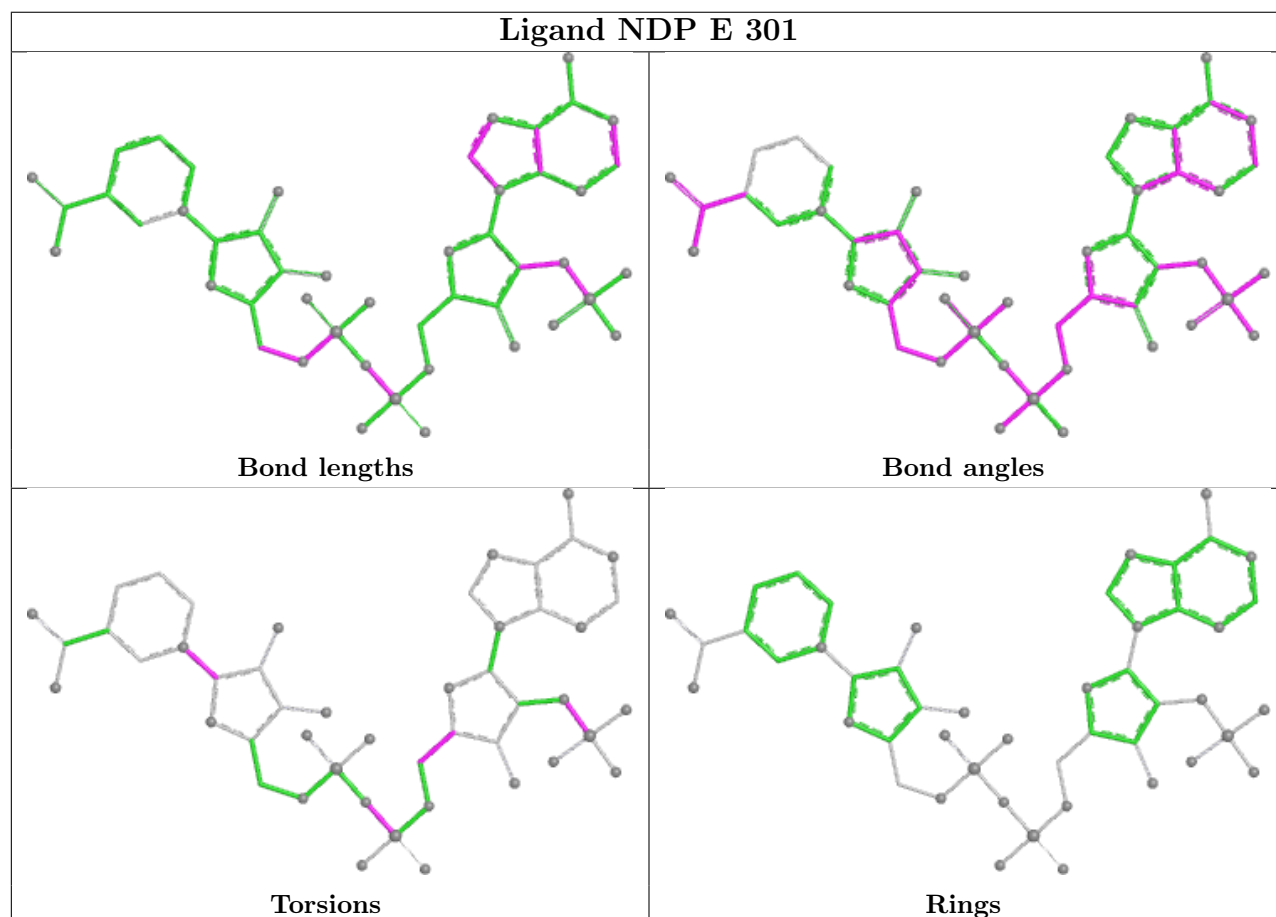
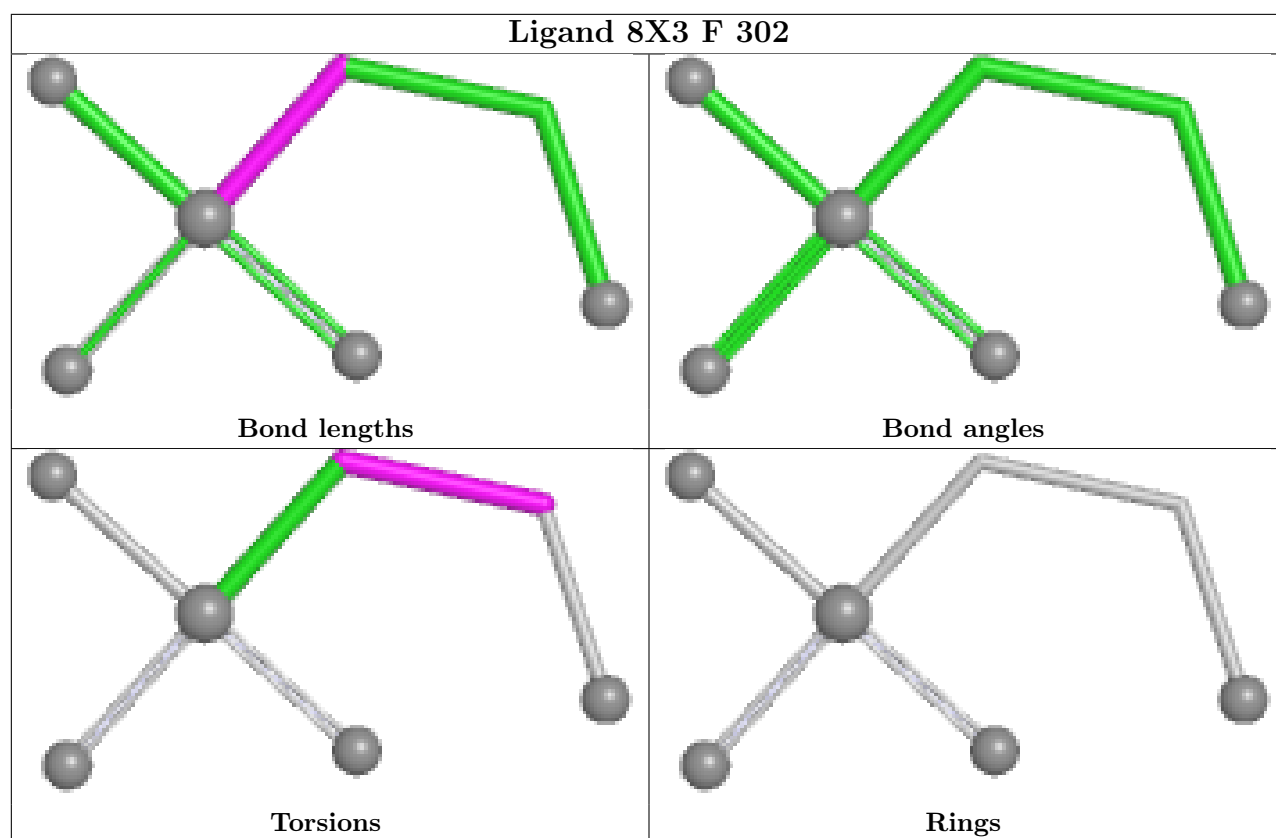
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	B	301	NDP	2	0
3	B	302	8X3	1	0
3	H	302	8X3	1	0
2	F	301	NDP	3	0
3	E	302	8X3	1	0
2	G	301	NDP	3	0
3	G	302	8X3	1	0
2	C	301	NDP	4	0

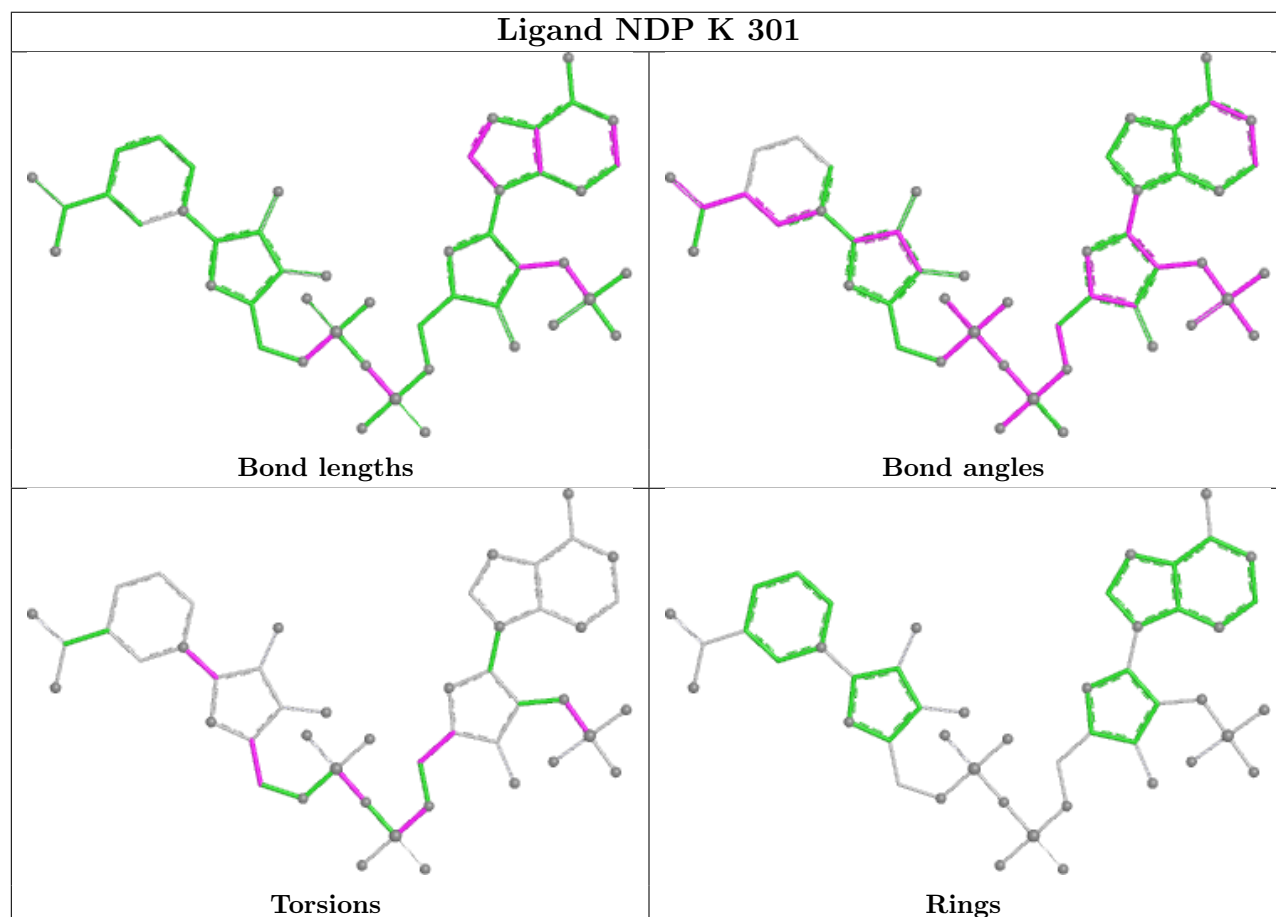
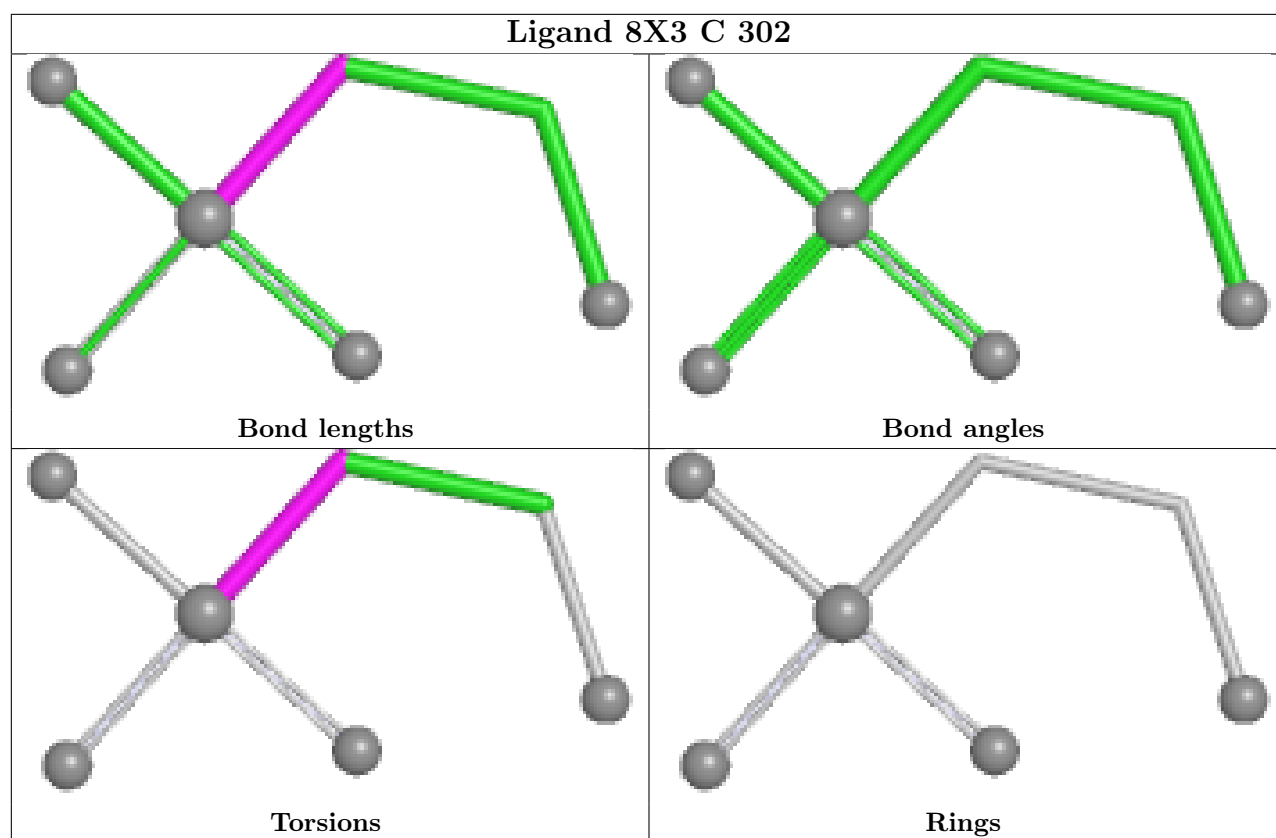
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.

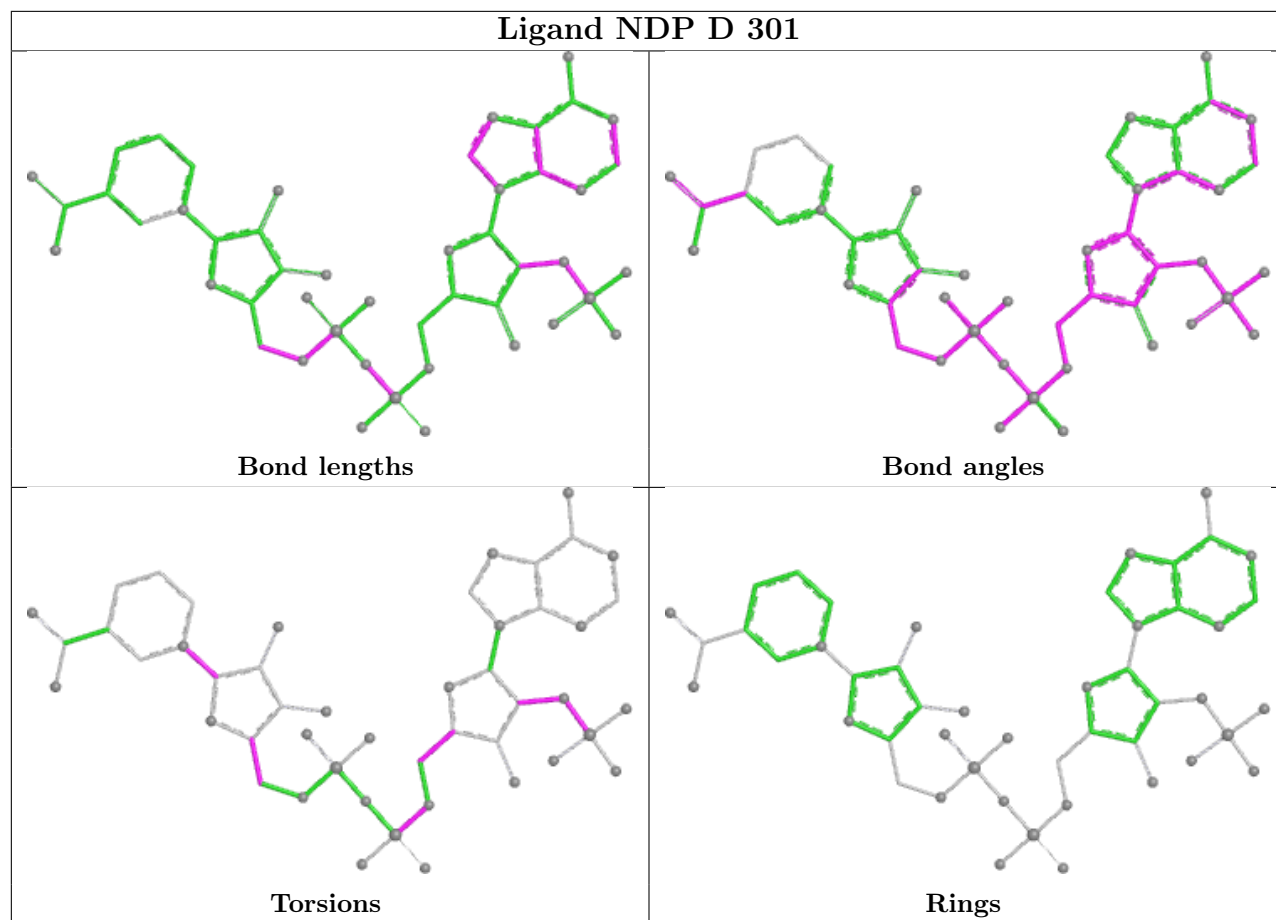


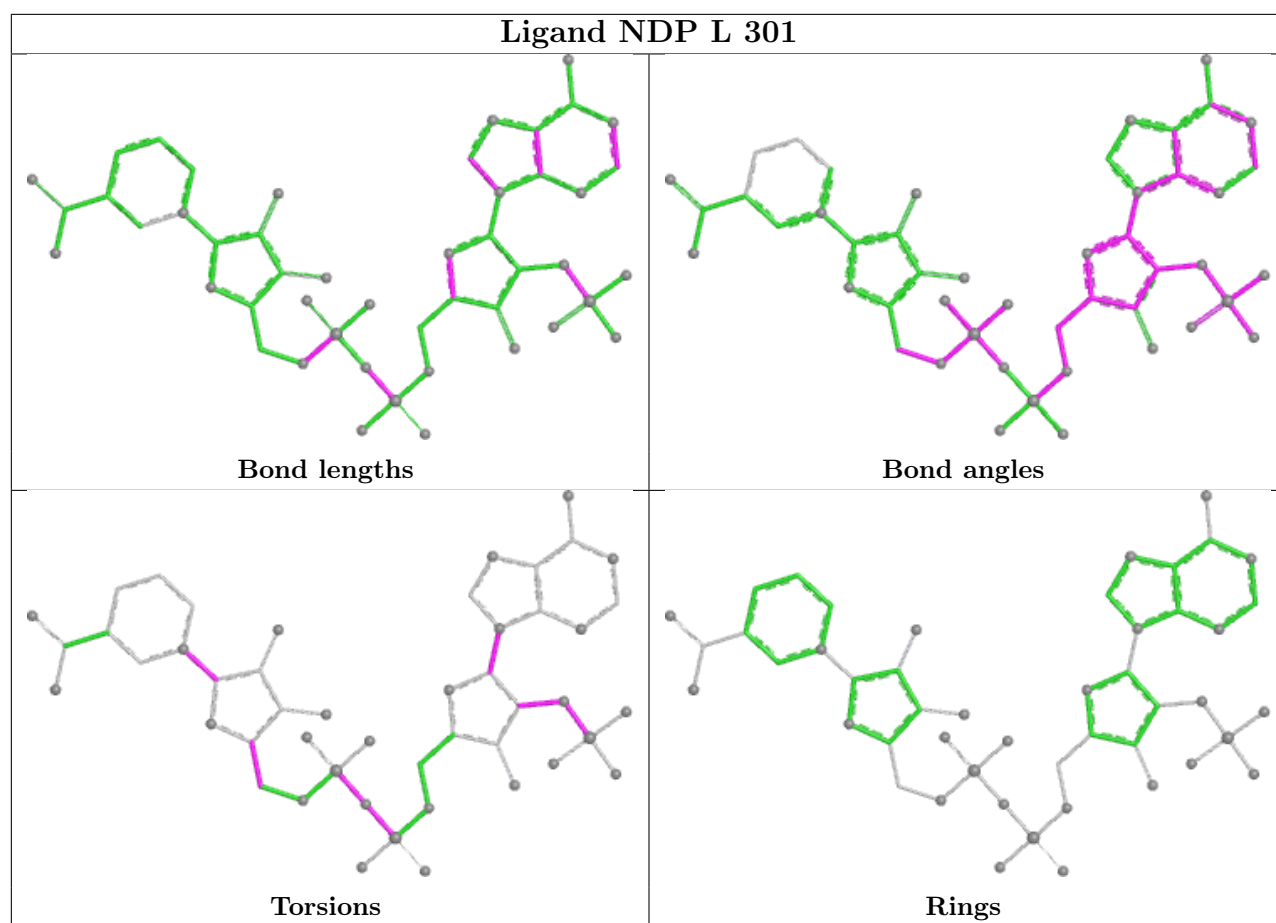




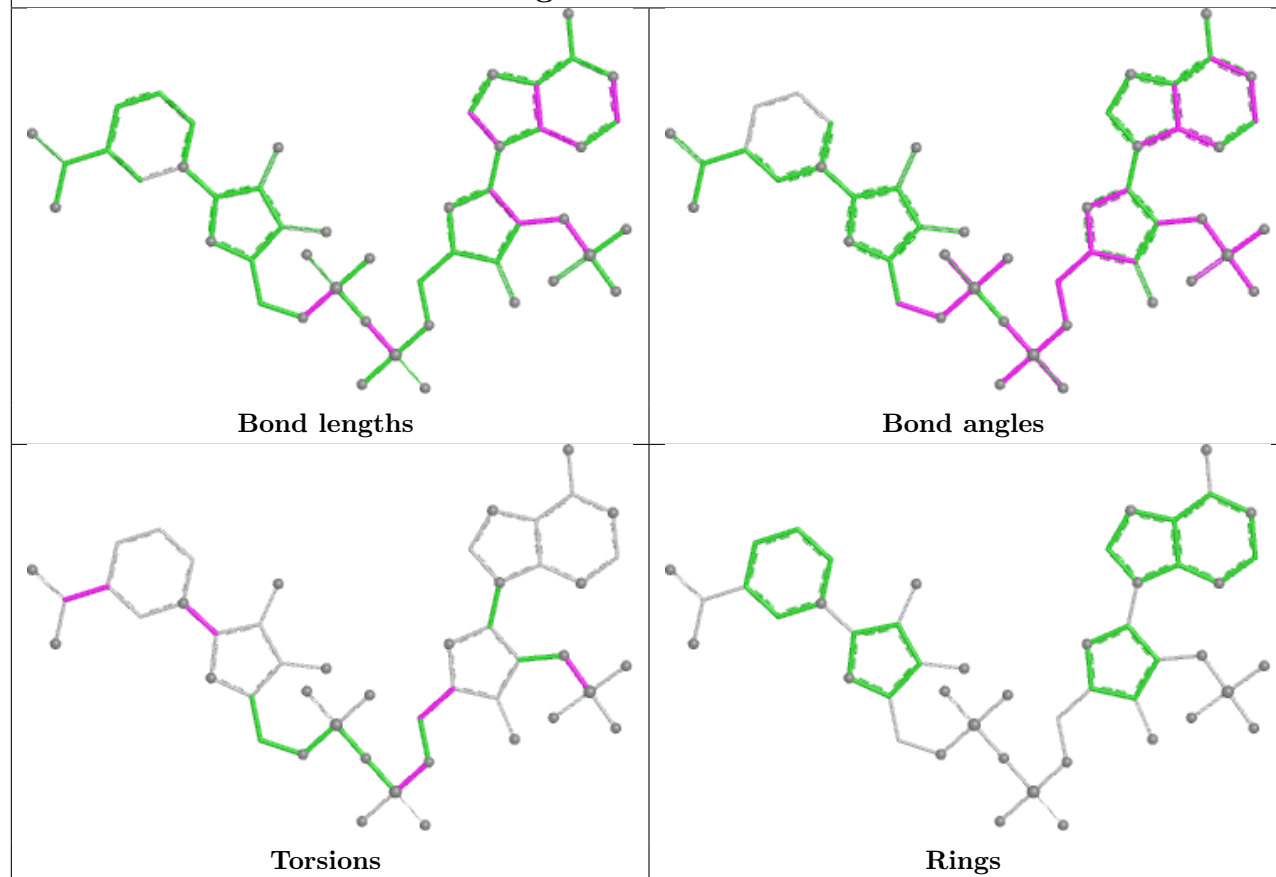




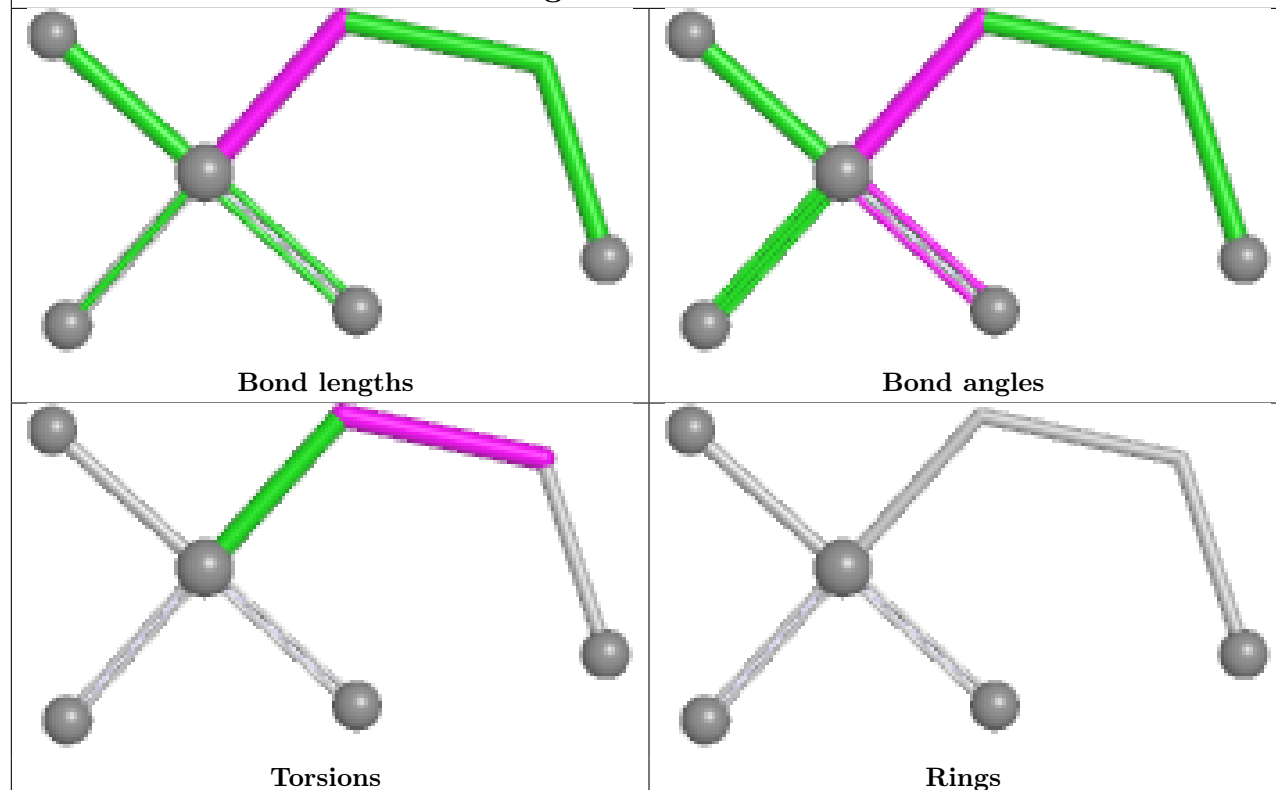


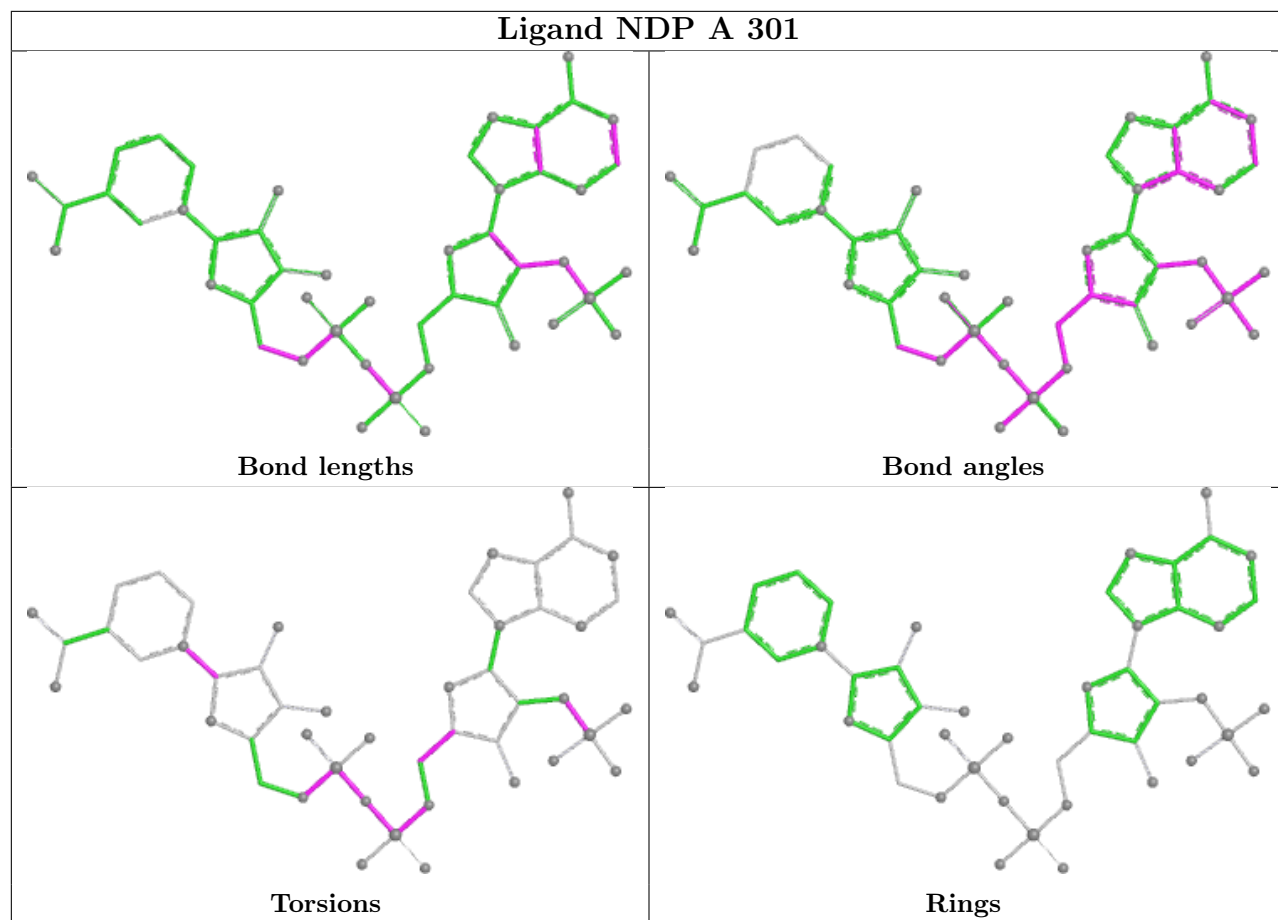


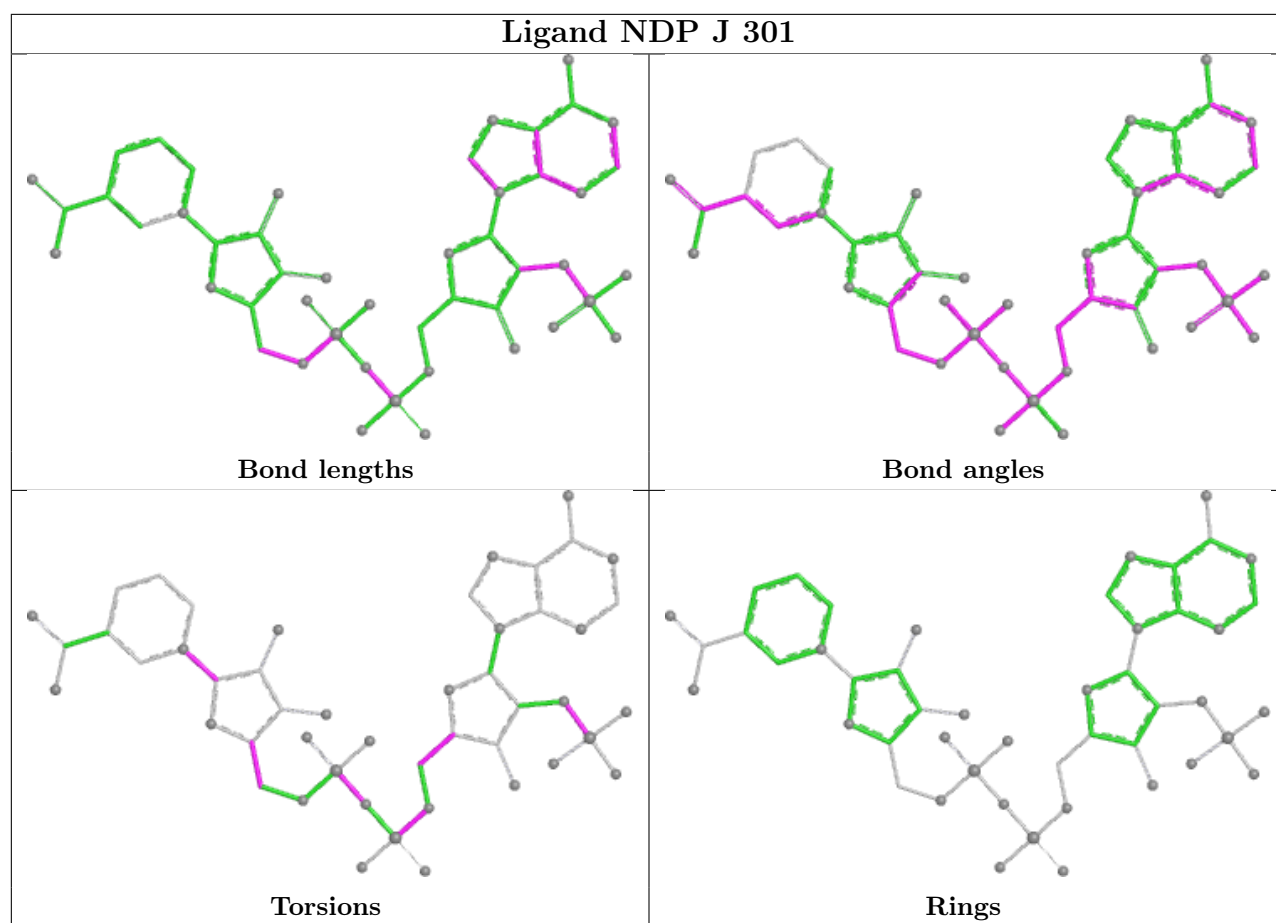
Ligand NDP I 301

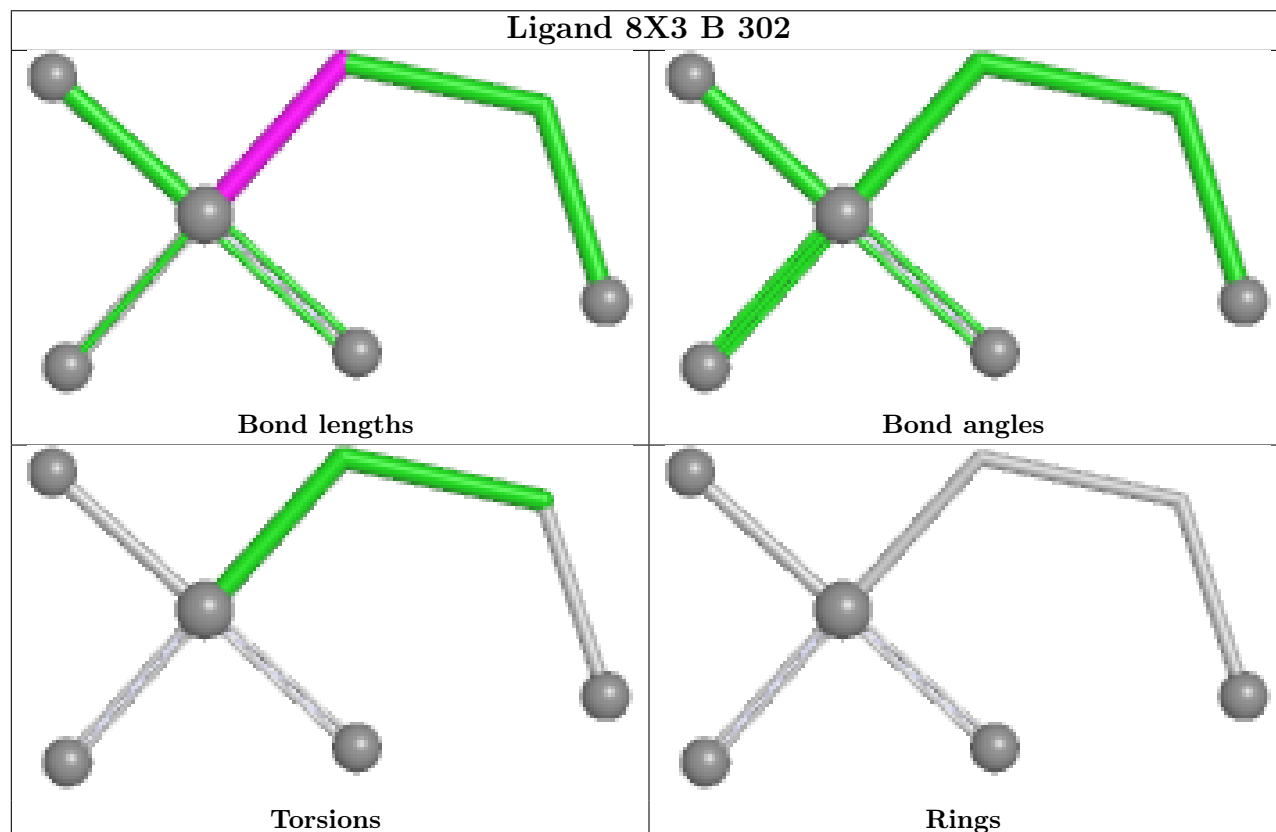
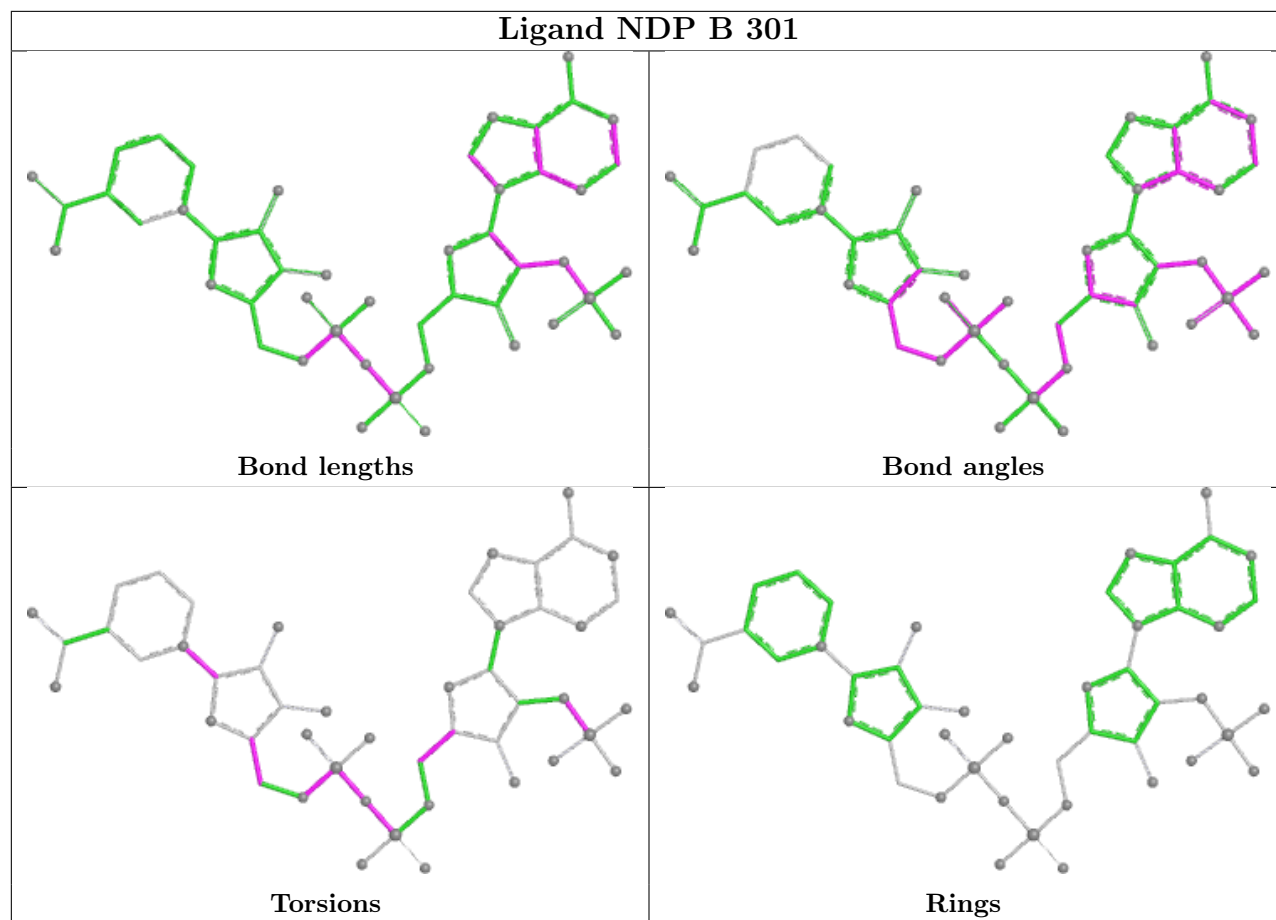


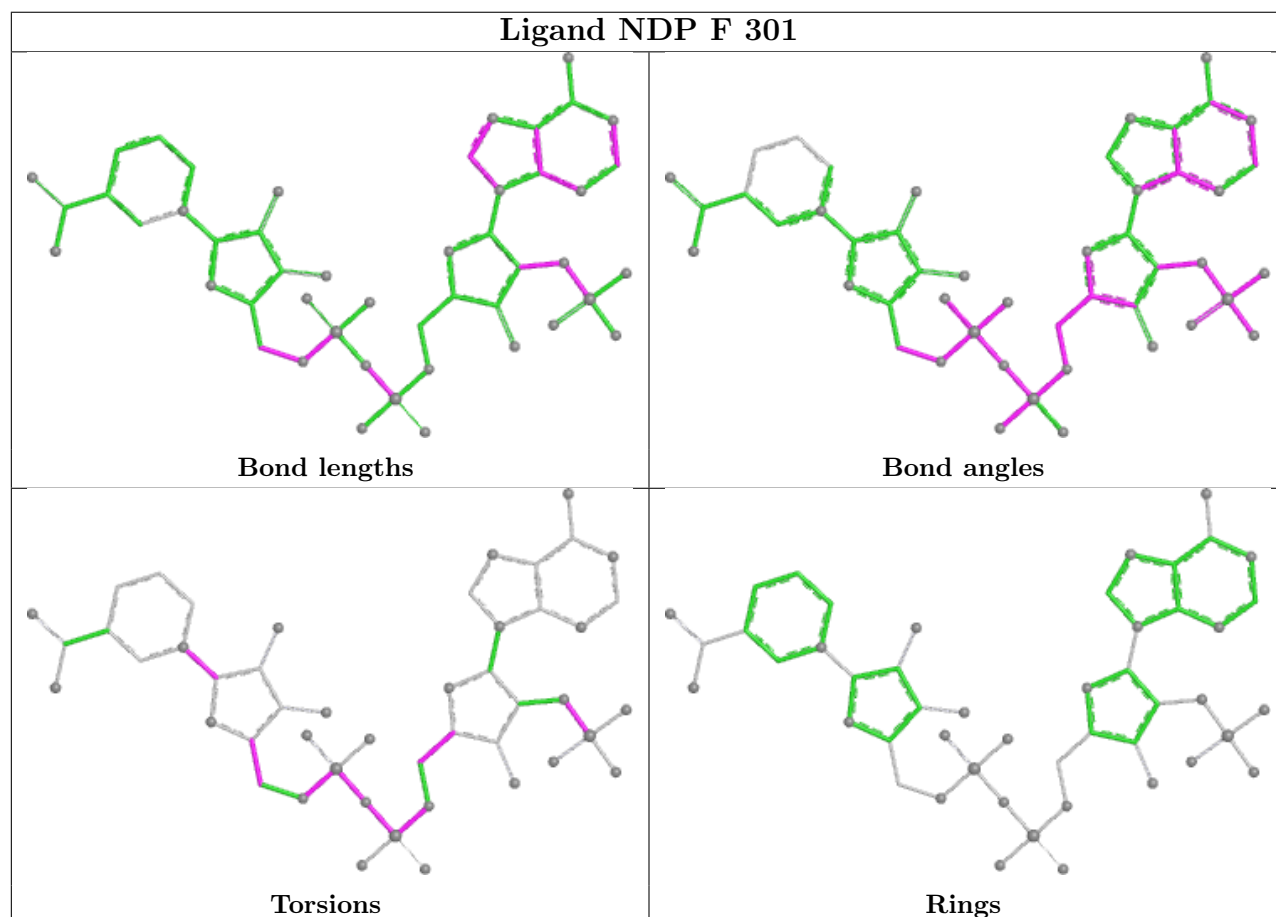
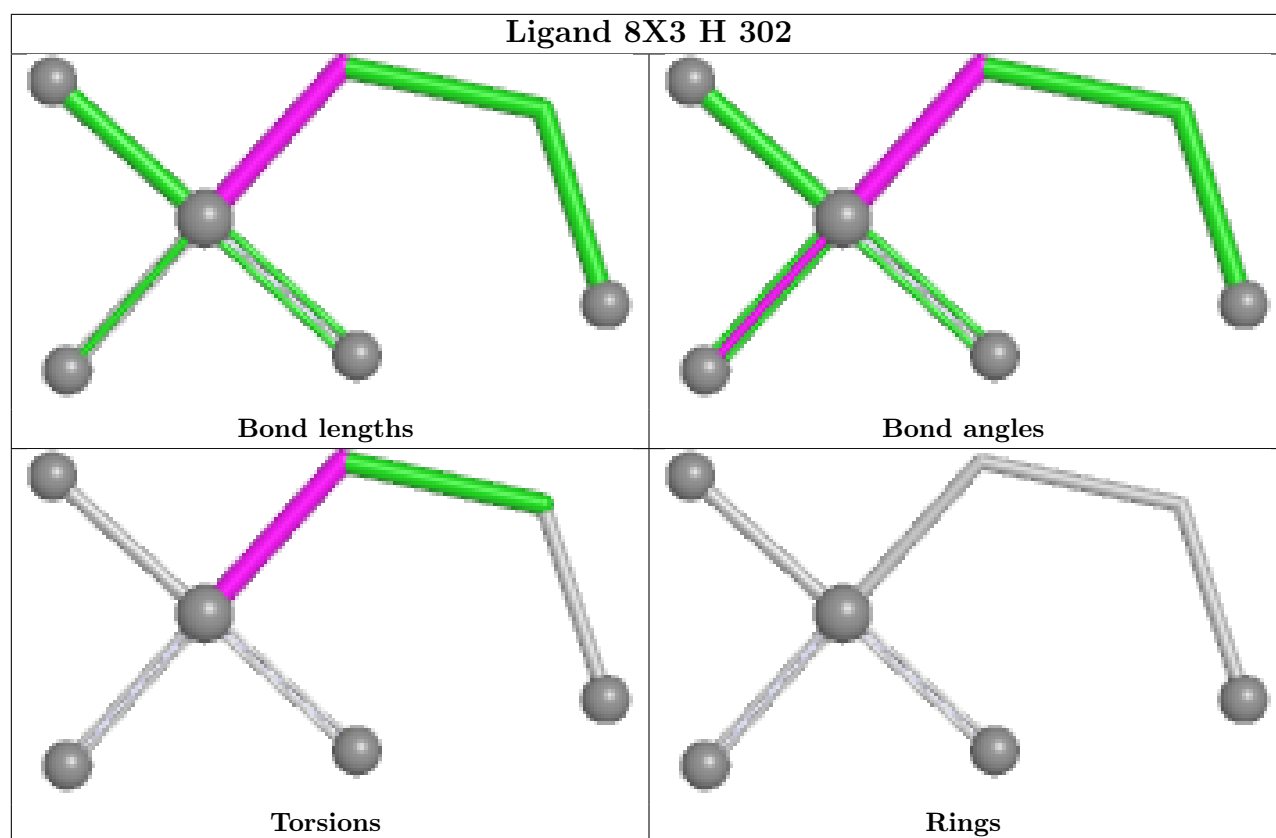
Ligand 8X3 I 302

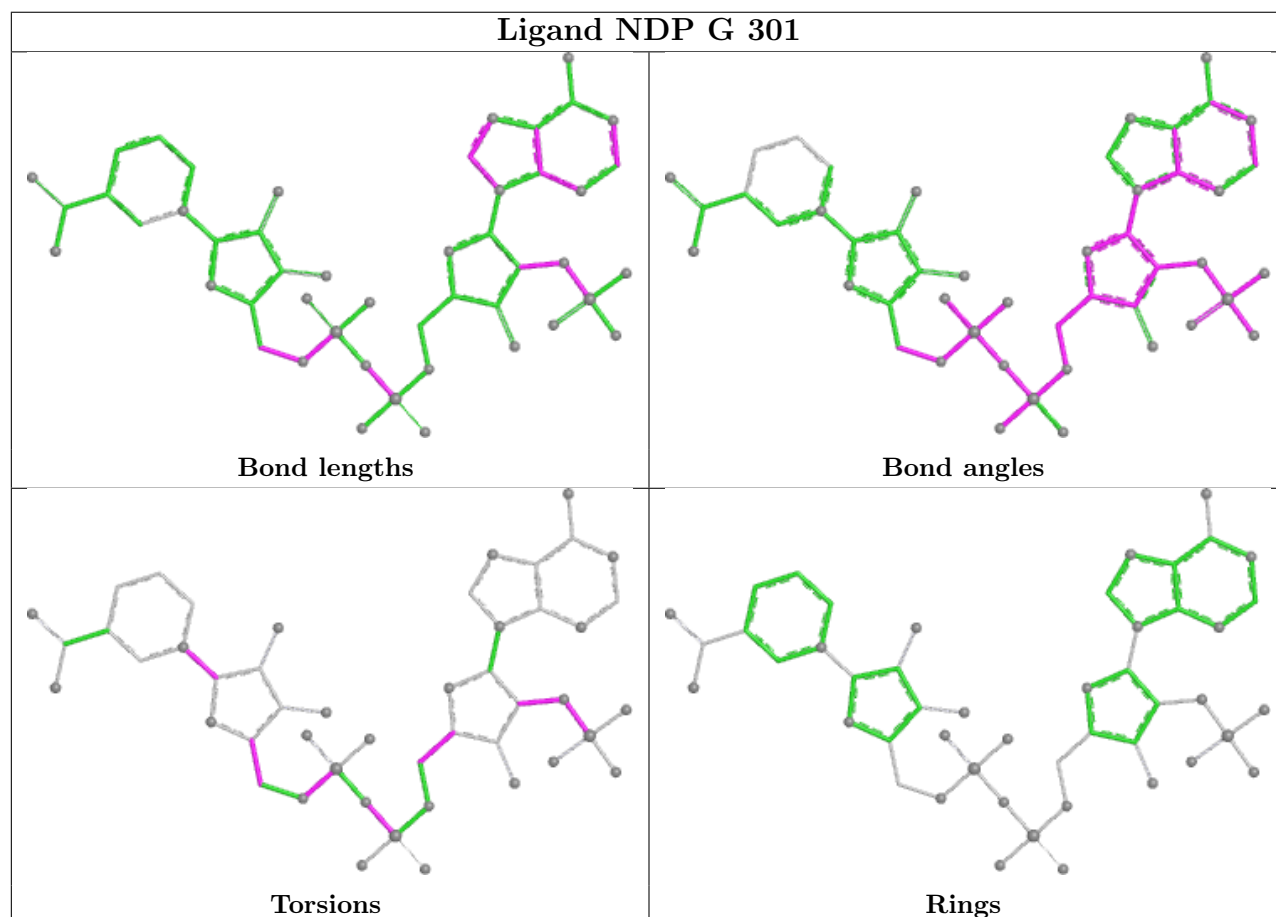
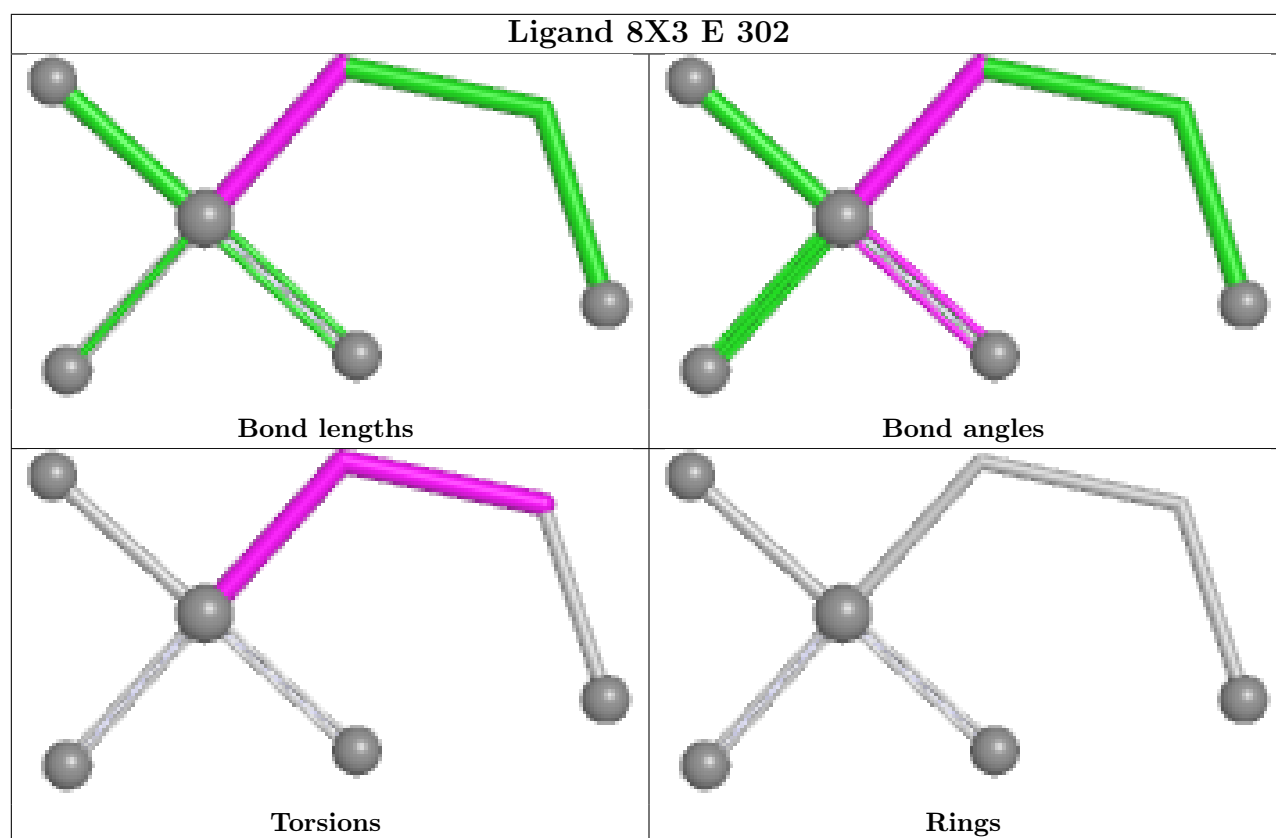


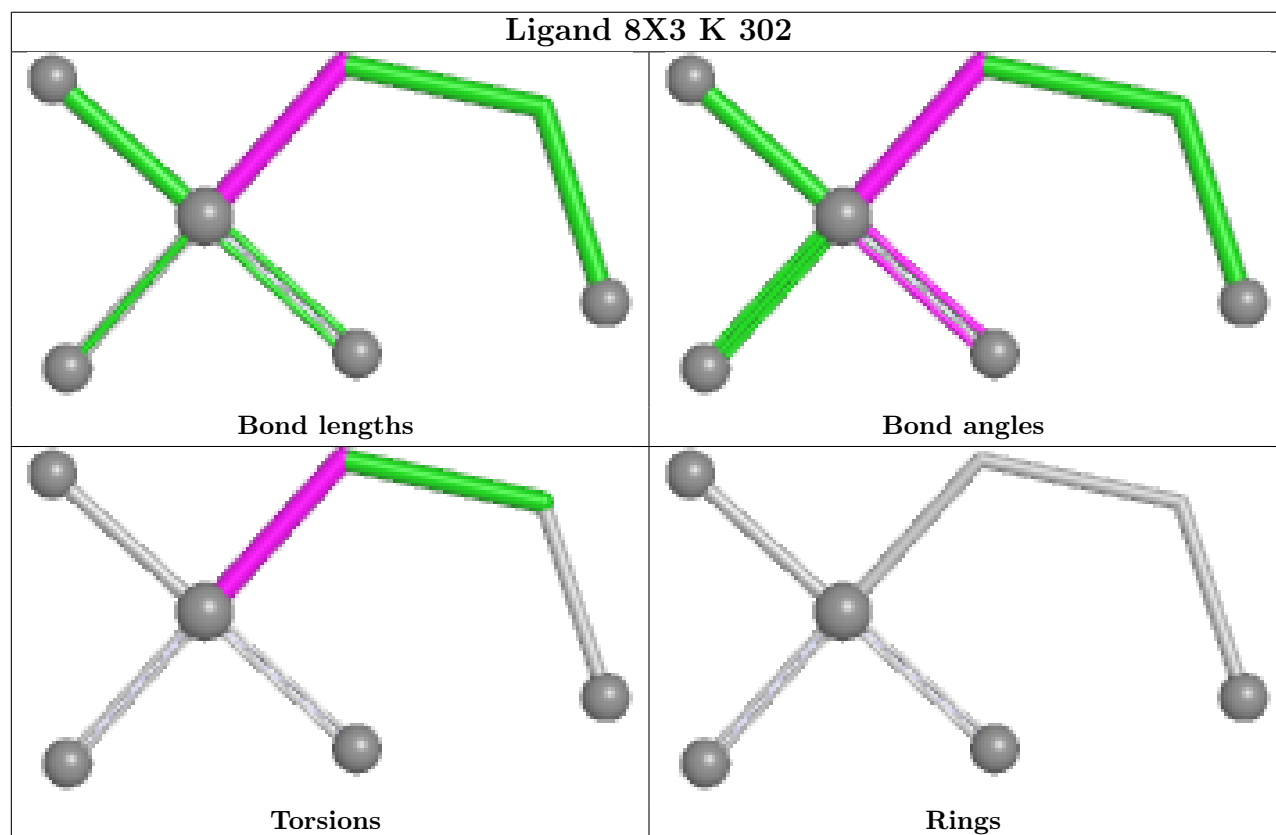
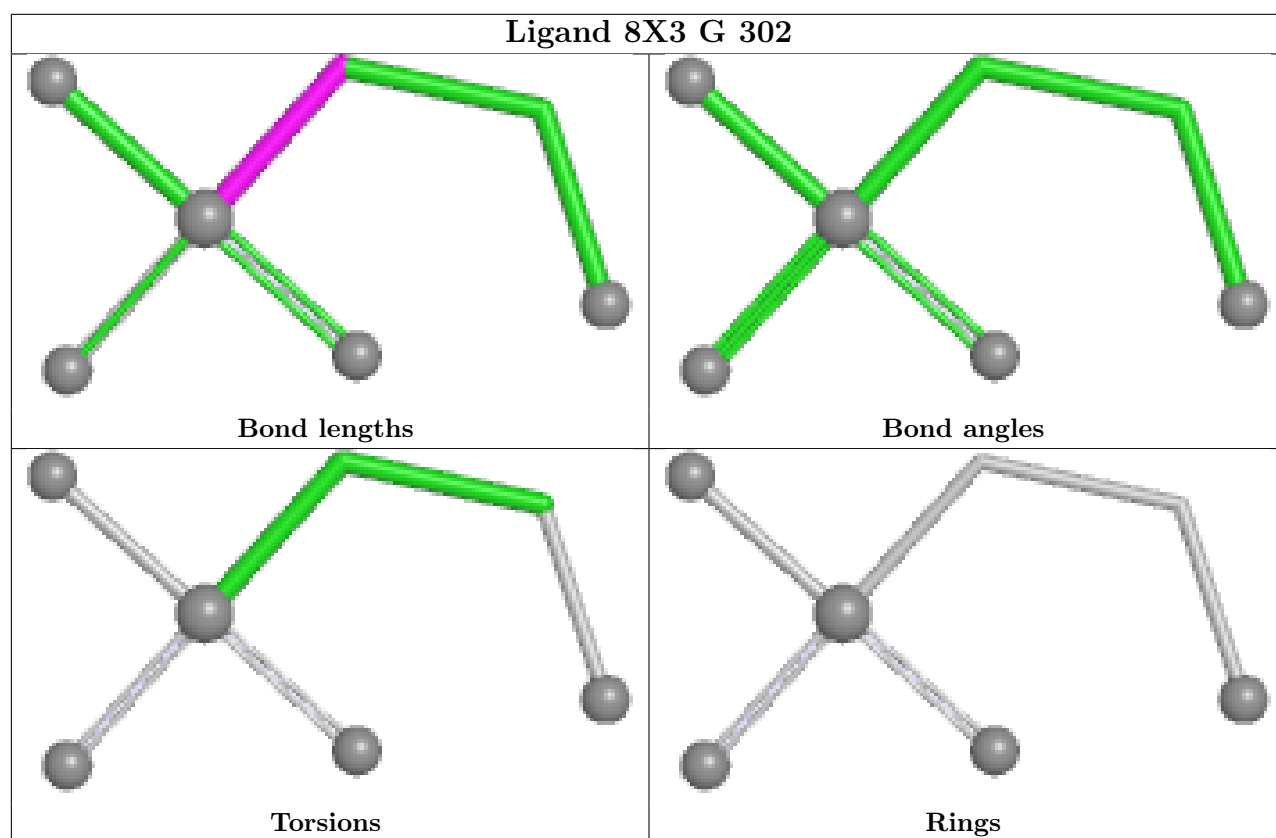


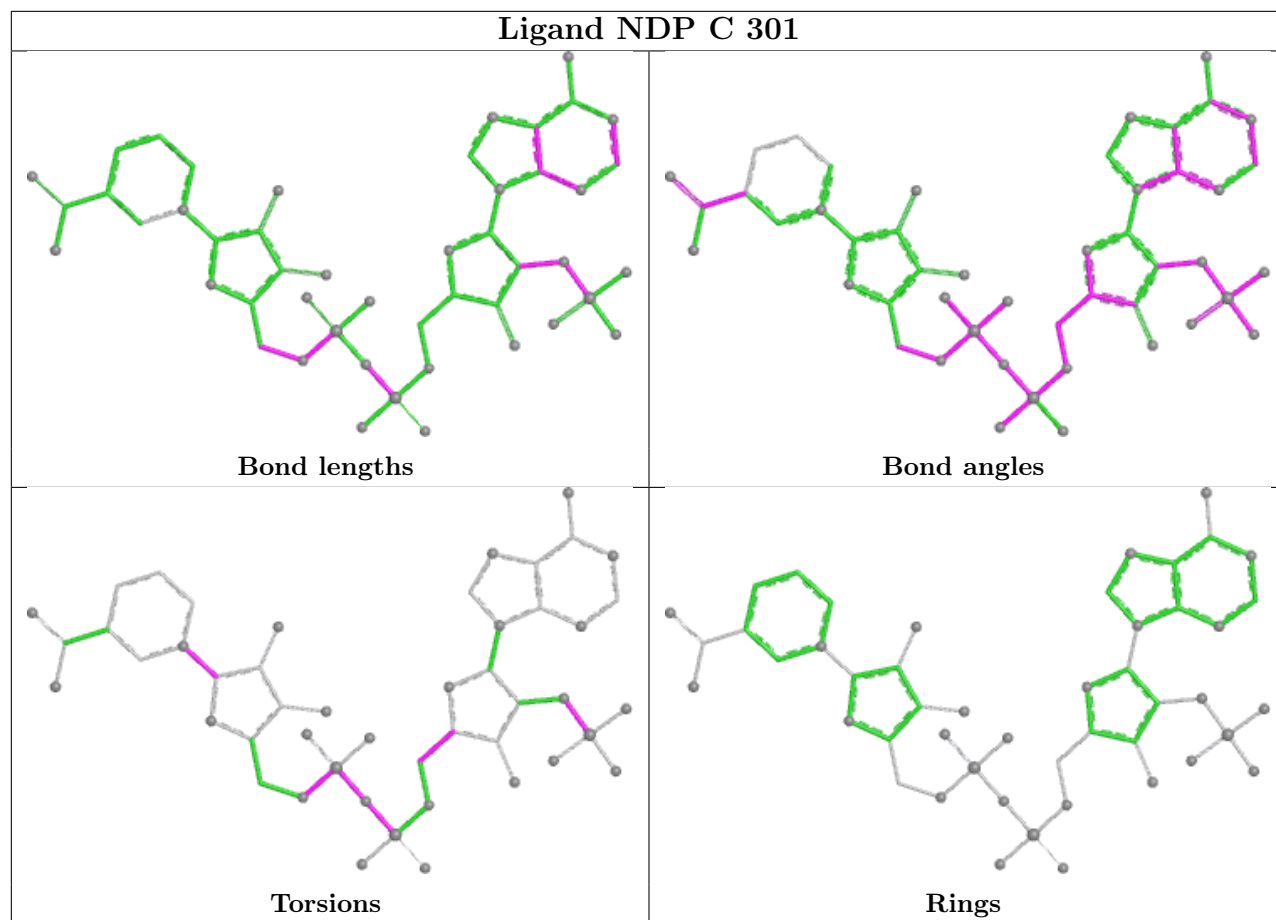












5.7 Other polymers [i](#)

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, 95th 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 ²)	Q<0.9
1	A	251/256 (98%)	-0.60	1 (0%) 88 84	16, 28, 43, 72	0
1	B	251/256 (98%)	-0.32	0 100 100	20, 36, 52, 65	0
1	C	250/256 (97%)	-0.46	1 (0%) 88 84	23, 33, 48, 58	0
1	D	251/256 (98%)	-0.38	0 100 100	20, 36, 54, 64	0
1	E	251/256 (98%)	-0.26	1 (0%) 88 84	23, 38, 57, 77	0
1	F	251/256 (98%)	-0.25	0 100 100	24, 40, 58, 77	0
1	G	251/256 (98%)	0.30	0 100 100	27, 46, 71, 85	0
1	H	251/256 (98%)	0.09	2 (0%) 82 75	26, 50, 70, 87	0
1	I	251/256 (98%)	0.19	1 (0%) 88 84	27, 49, 62, 70	0
1	J	251/256 (98%)	-0.08	0 100 100	27, 49, 67, 81	0
1	K	251/256 (98%)	0.14	3 (1%) 76 68	32, 54, 75, 86	0
1	L	251/256 (98%)	0.43	5 (1%) 65 56	29, 54, 73, 88	0
All	All	3011/3072 (98%)	-0.10	14 (0%) 87 82	16, 42, 68, 88	0

The worst 5 of 14 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	K	50	SER	3.0
1	E	4	SER	2.7
1	L	11	GLY	2.6
1	H	4	SER	2.5
1	L	12	ALA	2.3

6.2 Non-standard residues in protein, DNA, RNA chains ⓘ

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

6.3 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

6.4 Ligands ⓘ

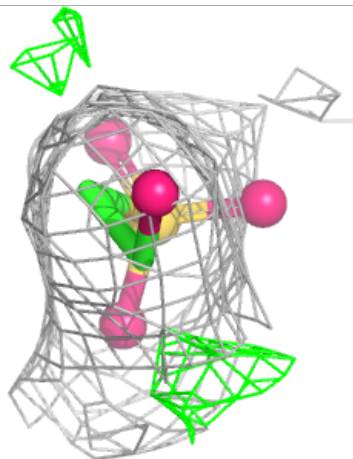
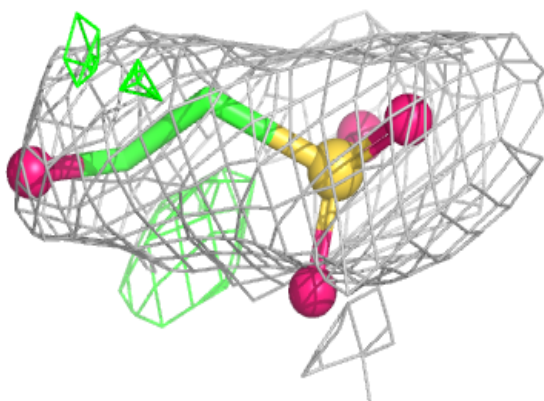
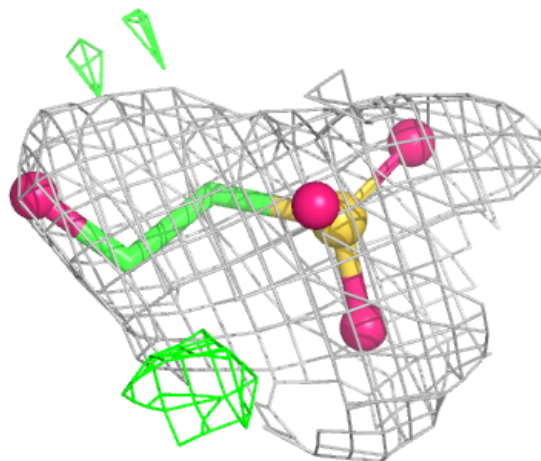
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
3	8X3	I	302	7/7	0.79	0.15	58,63,92,106	0
3	8X3	J	302	7/7	0.79	0.18	51,64,84,107	0
3	8X3	L	302	7/7	0.79	0.16	64,80,105,116	0
3	8X3	H	302	7/7	0.80	0.15	38,54,71,100	0
3	8X3	D	302	7/7	0.80	0.15	39,46,73,114	0
2	NDP	L	301	48/48	0.82	0.12	37,58,71,78	0
3	8X3	K	302	7/7	0.83	0.12	52,66,69,110	0
3	8X3	A	302	7/7	0.83	0.11	36,41,75,106	0
3	8X3	G	302	7/7	0.84	0.11	34,51,81,96	0
3	8X3	C	302	7/7	0.84	0.13	38,46,87,115	0
3	8X3	E	302	7/7	0.85	0.12	38,47,67,112	0
3	8X3	F	302	7/7	0.87	0.12	35,44,55,80	0
2	NDP	K	301	48/48	0.90	0.10	42,55,67,80	0
3	8X3	B	302	7/7	0.91	0.09	32,47,60,100	0
2	NDP	H	301	48/48	0.92	0.09	30,46,59,67	0
2	NDP	I	301	48/48	0.92	0.09	34,52,68,75	0
2	NDP	G	301	48/48	0.94	0.09	21,38,49,58	0
2	NDP	J	301	48/48	0.94	0.08	35,49,61,73	0
2	NDP	E	301	48/48	0.96	0.07	19,31,42,55	0
2	NDP	F	301	48/48	0.96	0.07	21,35,46,51	0
2	NDP	B	301	48/48	0.96	0.07	18,32,41,47	0
2	NDP	D	301	48/48	0.96	0.07	25,34,42,46	0
2	NDP	C	301	48/48	0.97	0.06	18,30,36,40	0
2	NDP	A	301	48/48	0.97	0.06	14,24,34,40	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.

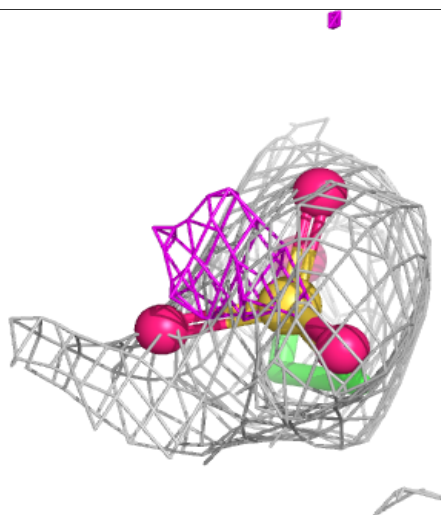
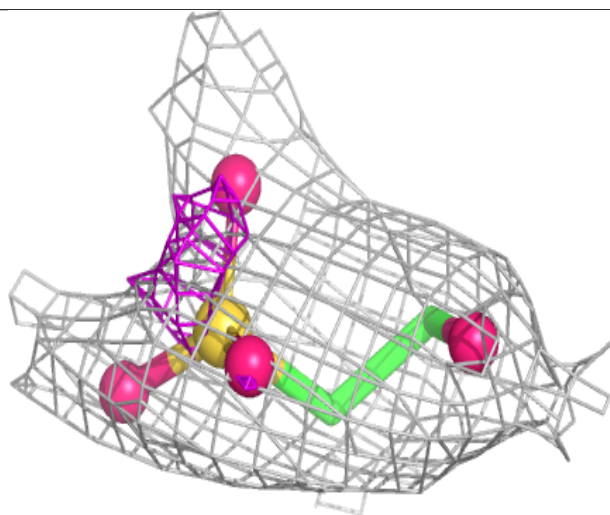
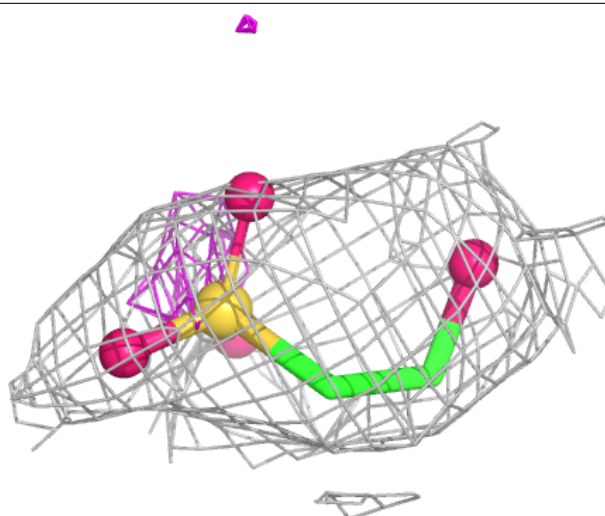
Electron density around 8X3 I 302:

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



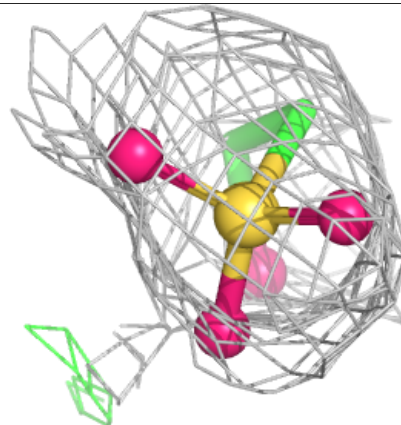
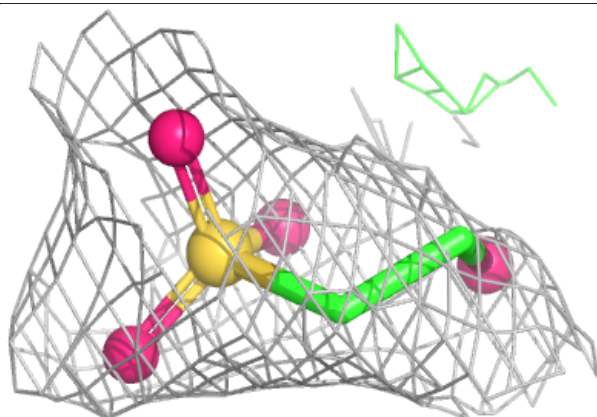
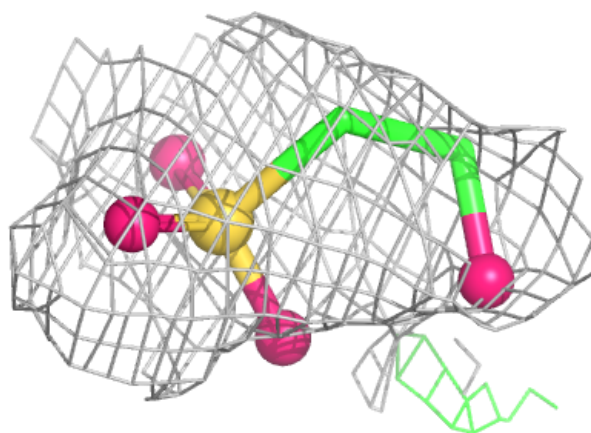
Electron density around 8X3 J 302:

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

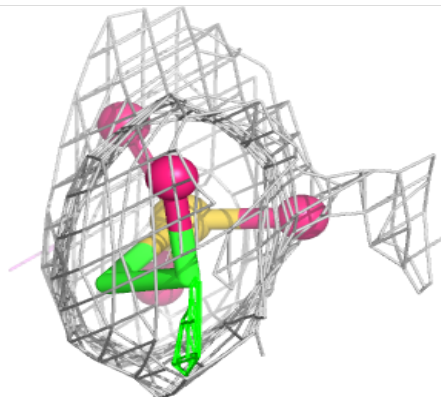
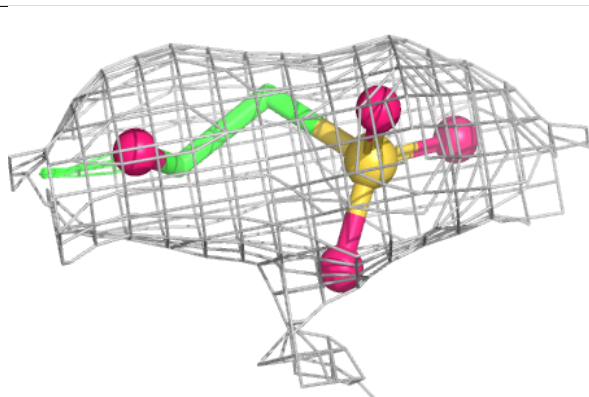
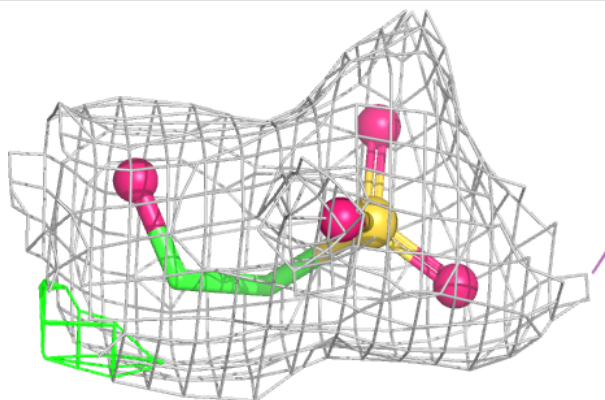


Electron density around 8X3 L 302:

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

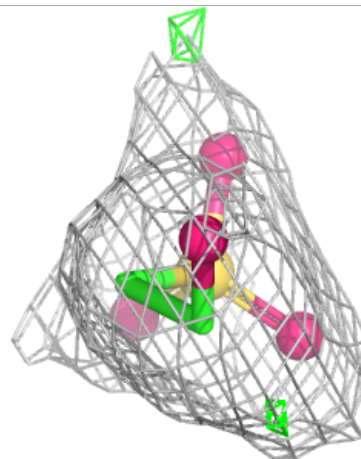
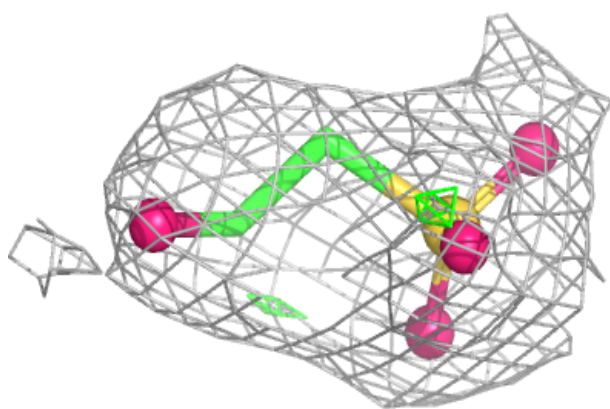
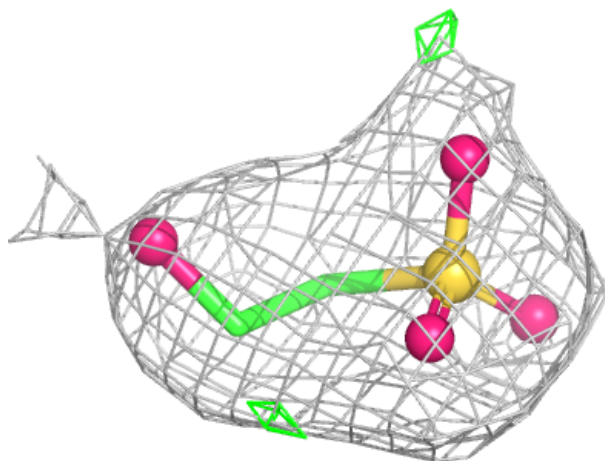
**Electron density around 8X3 H 302:**

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



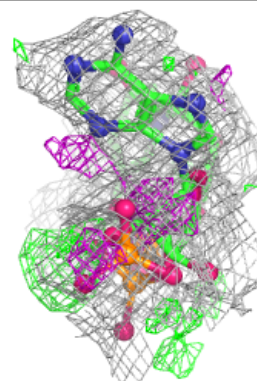
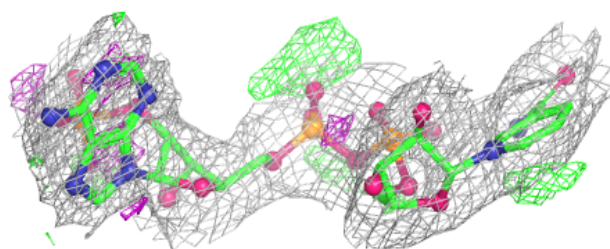
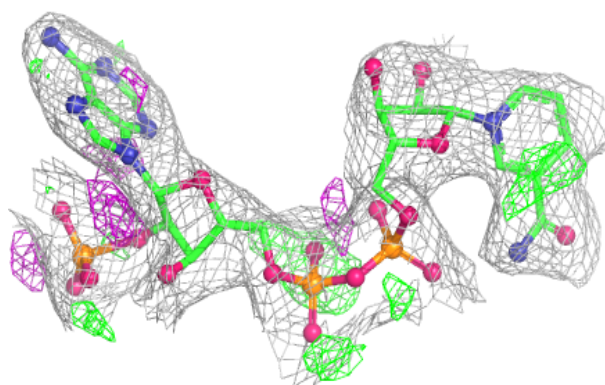
Electron density around 8X3 D 302:

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

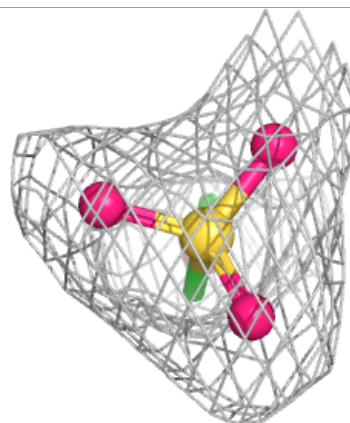
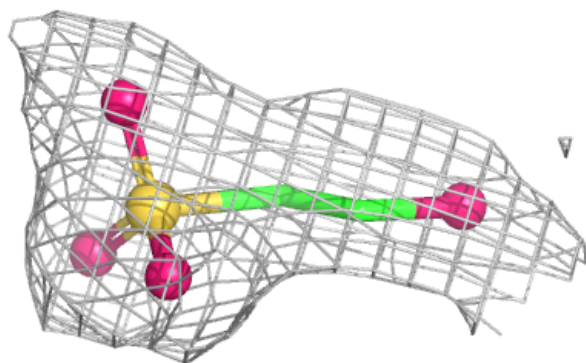
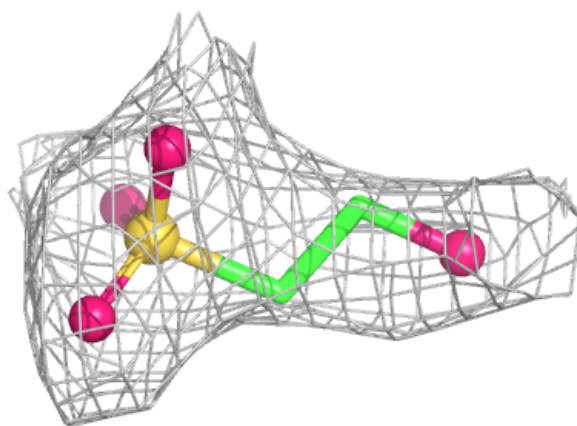


Electron density around NDP L 301:

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

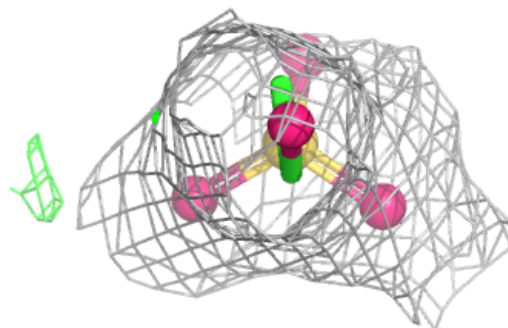
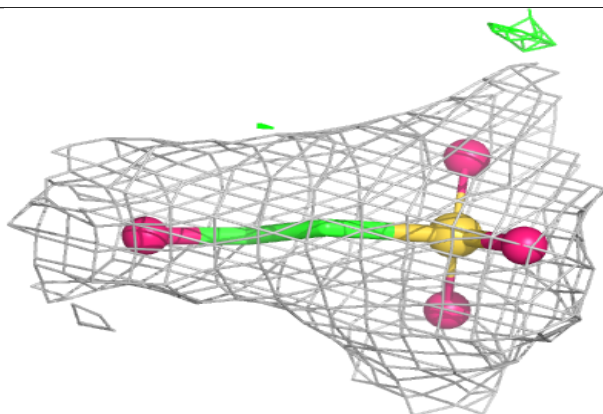
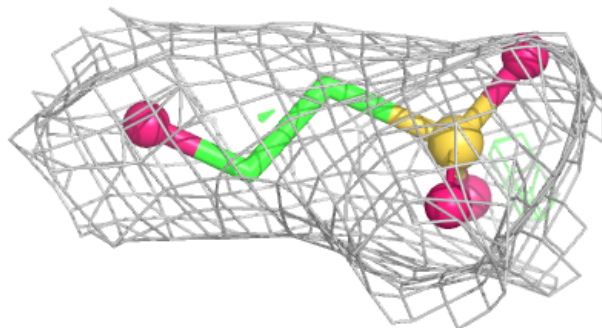
**Electron density around 8X3 K 302:**

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

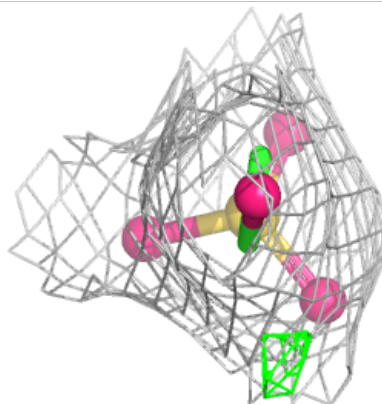
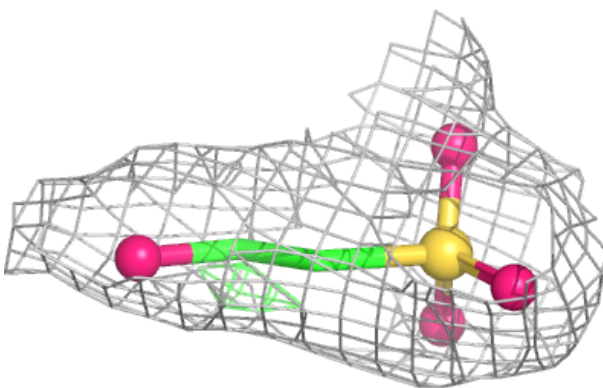
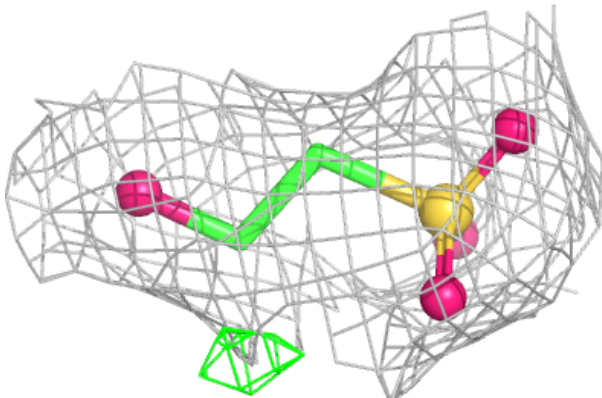


Electron density around 8X3 A 302:

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

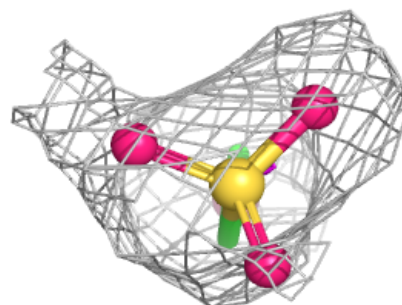
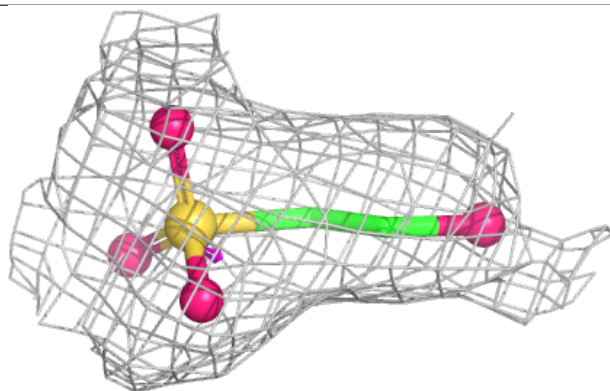
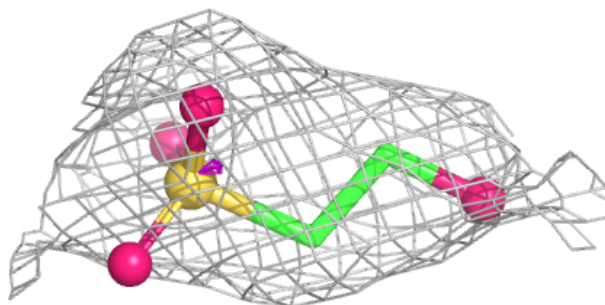
**Electron density around 8X3 G 302:**

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

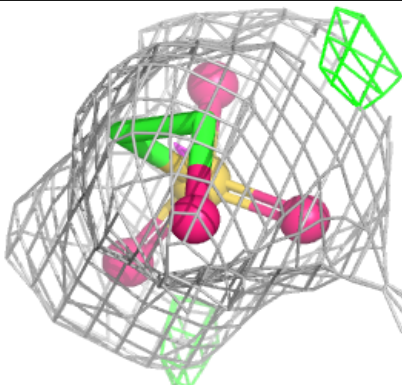
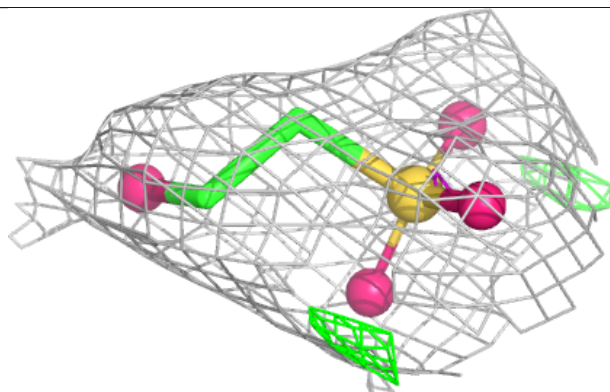
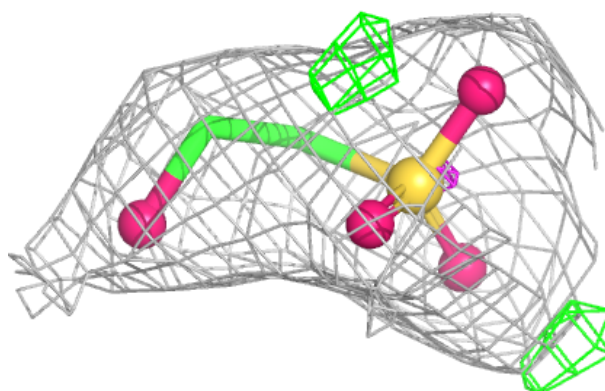


Electron density around 8X3 C 302:

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

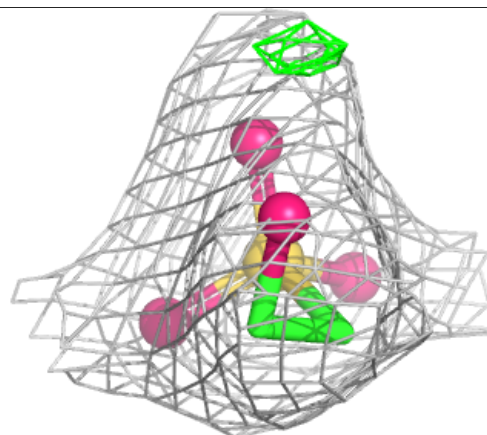
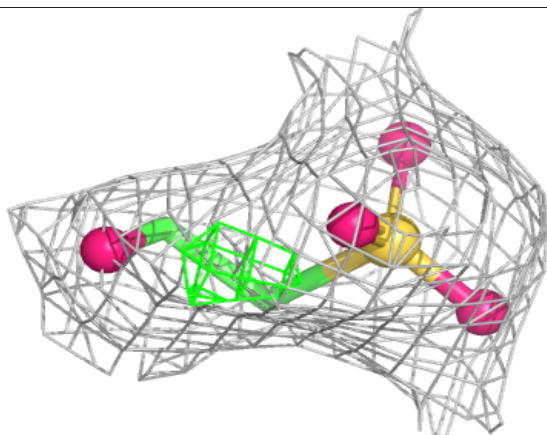
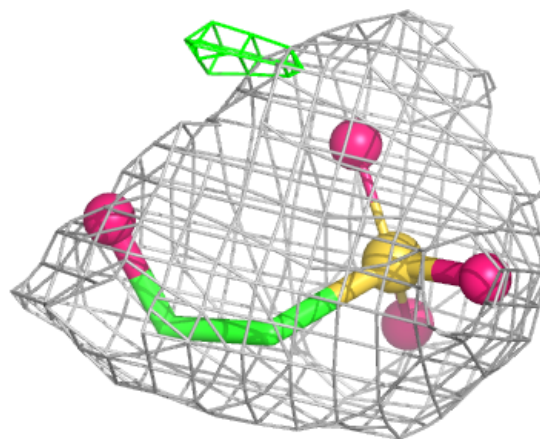
**Electron density around 8X3 E 302:**

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

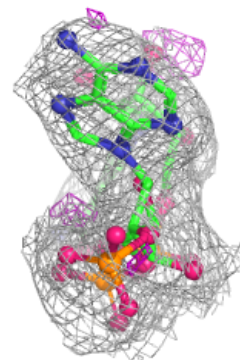
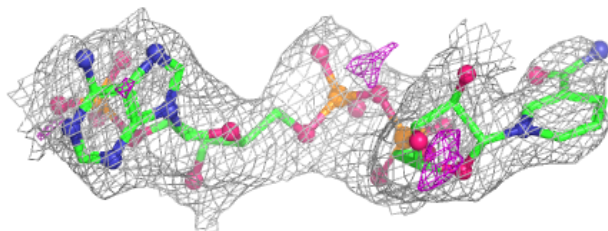
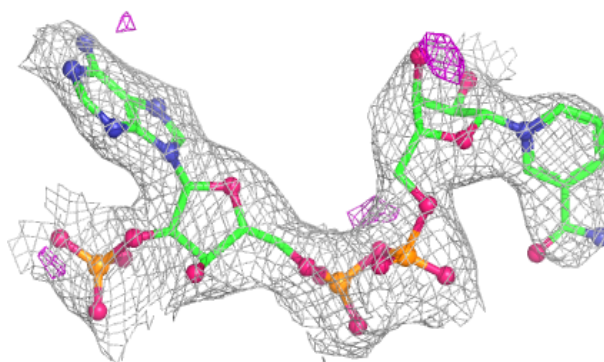


Electron density around 8X3 F 302:

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

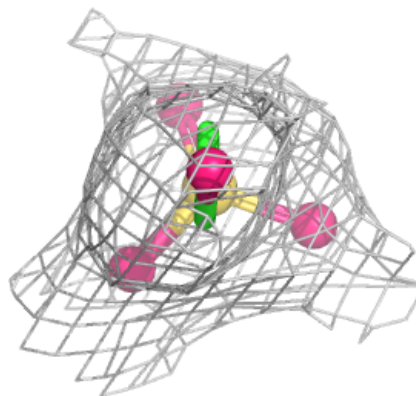
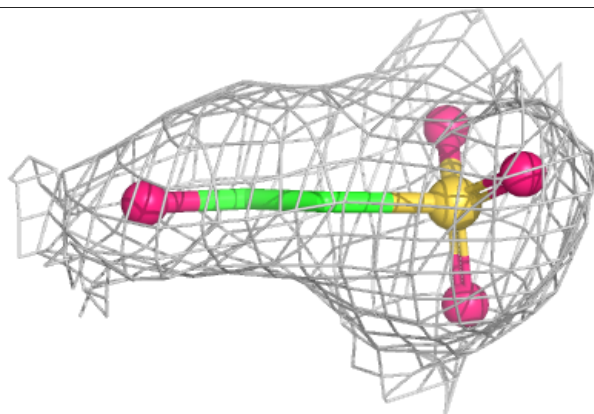
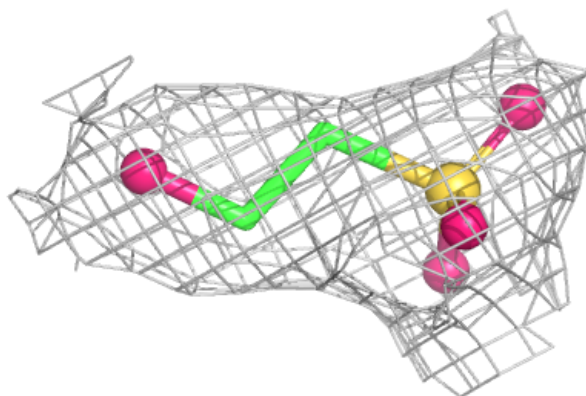
**Electron density around NDP K 301:**

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

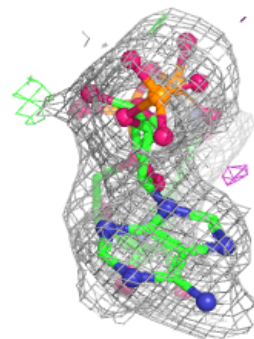
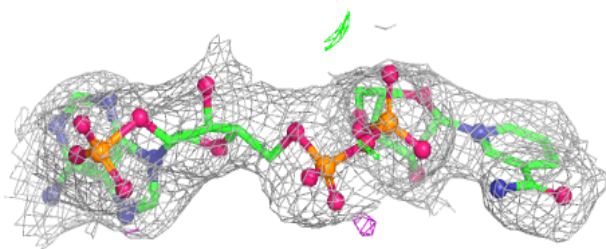
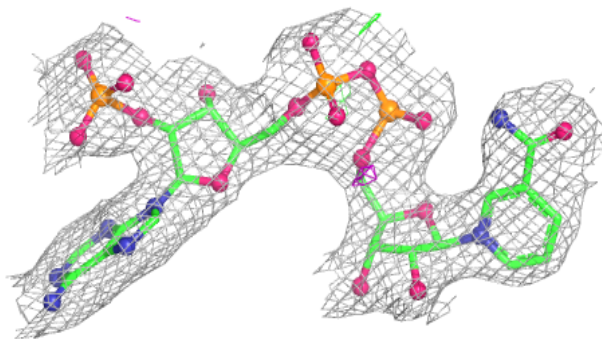


Electron density around 8X3 B 302:

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

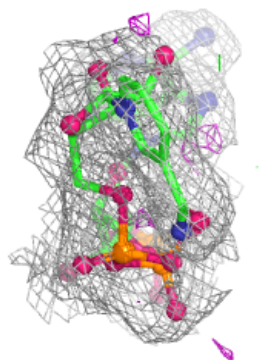
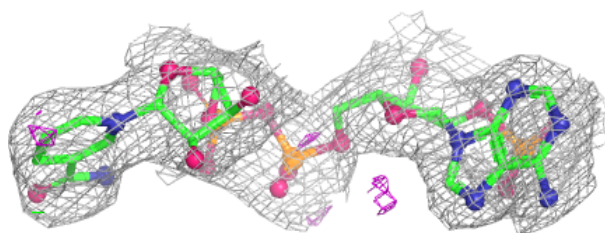
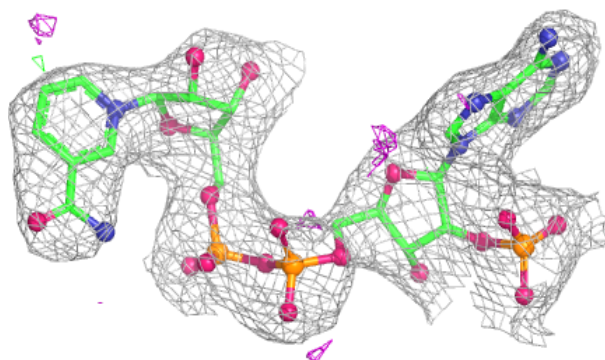
**Electron density around NDP H 301:**

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

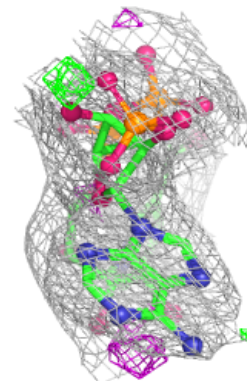
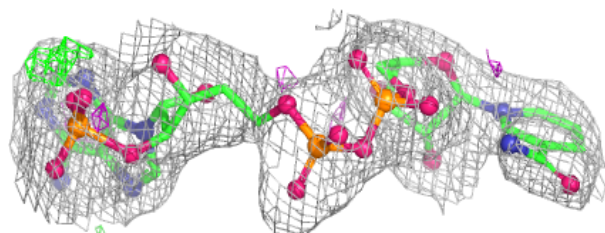
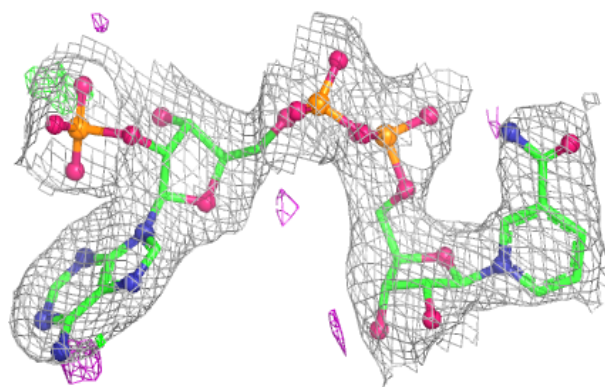


Electron density around NDP I 301:

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

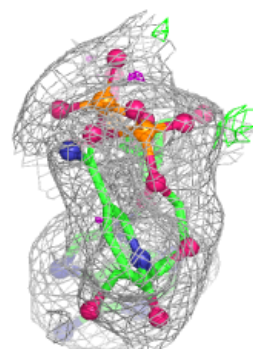
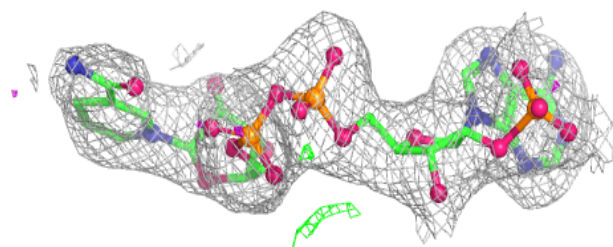
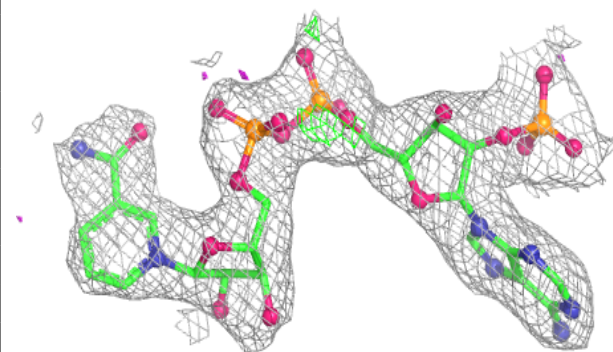
**Electron density around NDP G 301:**

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

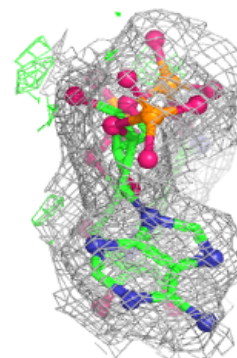
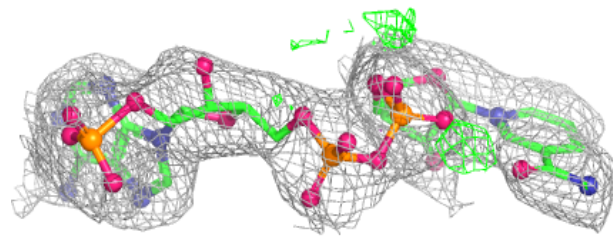
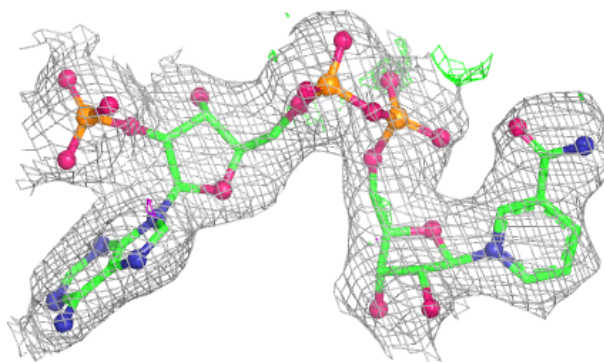


Electron density around NDP J 301:

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

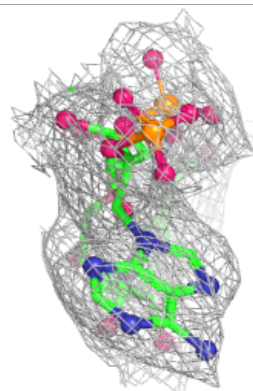
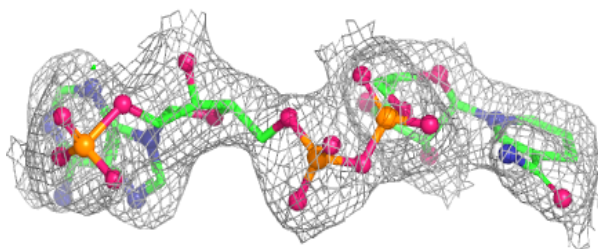
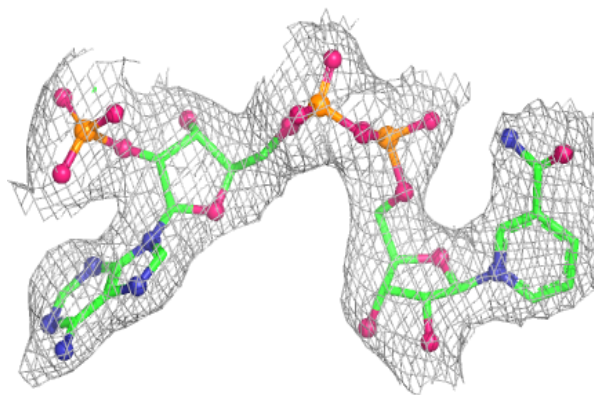
**Electron density around NDP E 301:**

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

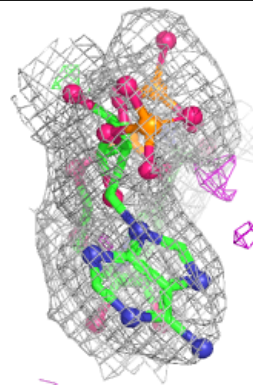
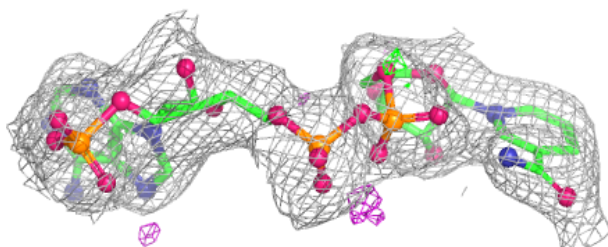
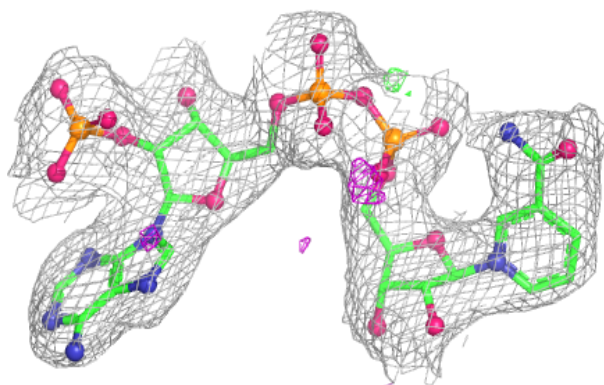


Electron density around NDP F 301:

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

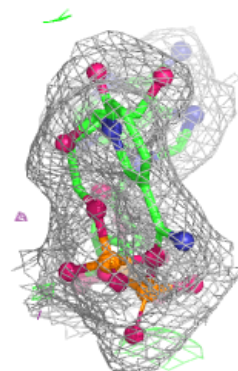
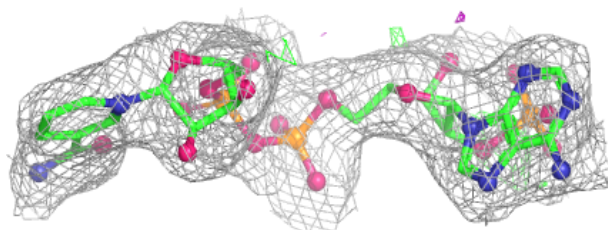
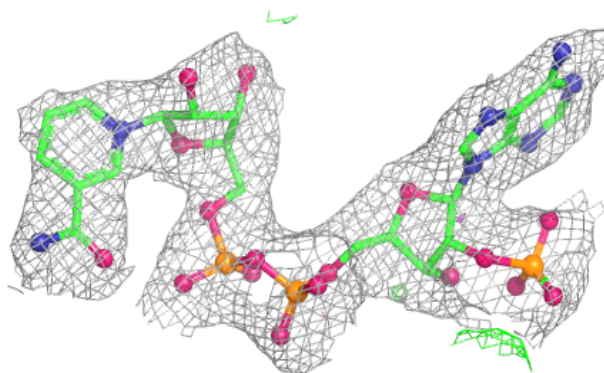
**Electron density around NDP B 301:**

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

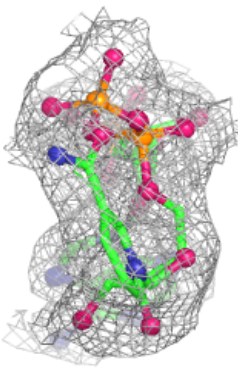
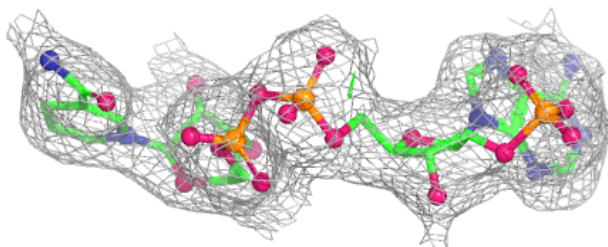
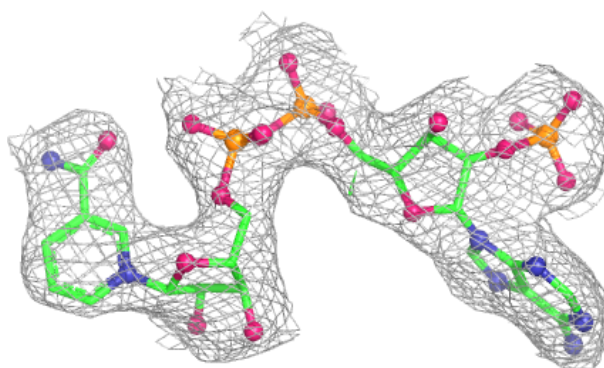


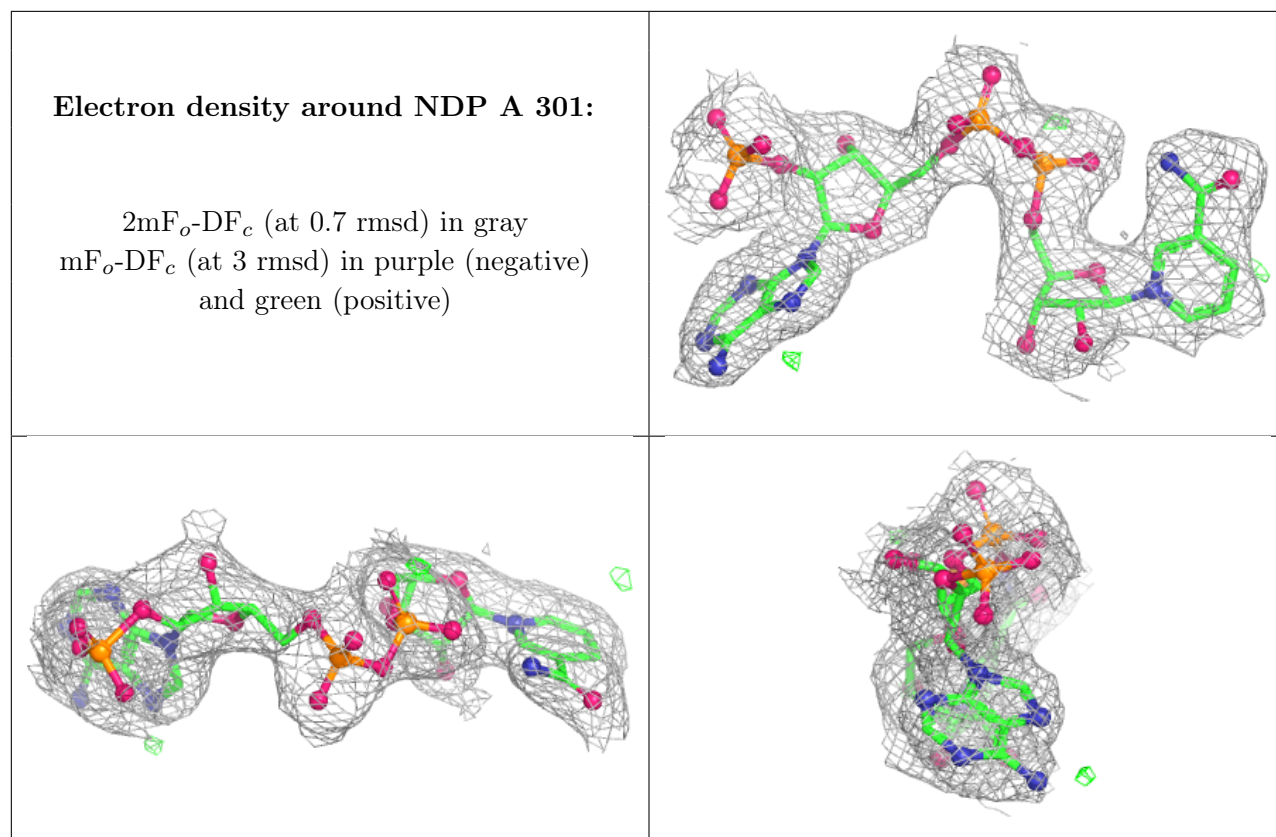
Electron density around NDP D 301:

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

**Electron density around NDP C 301:**

$2mF_o-DF_c$ (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.