



# Full wwPDB X-ray Structure Validation Report ⓘ

Jan 12, 2022 – 06:22 PM JST

PDB ID : 7ERE  
Title : Crystal structure of human Biliverdin IX-beta reductase B with Pyrantel Pamoate (PPA)  
Authors : Griesinger, C.; Lee, D.; Ryu, K.S.; Kim, M.; Ha, J.H.  
Deposited on : 2021-05-06  
Resolution : 1.60 Å(reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

We welcome your comments at [validation@mail.wwpdb.org](mailto:validation@mail.wwpdb.org)

A user guide is available at

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

with specific help available everywhere you see the ⓘ symbol.

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

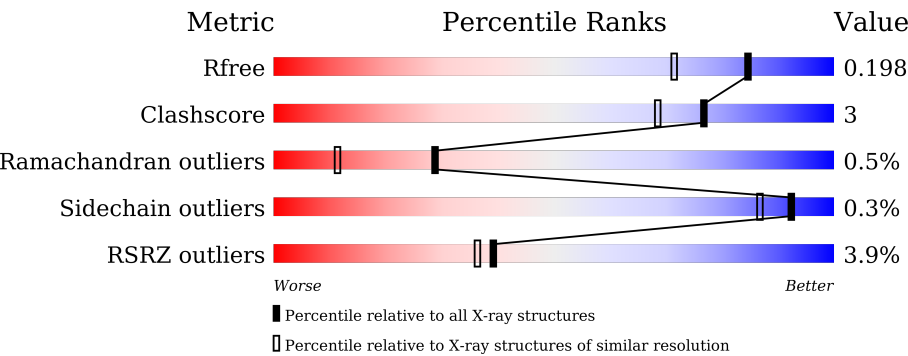
MolProbity : 4.02b-467  
Mogul : 1.8.5 (274361), CSD as541be (2020)  
Xtriage (Phenix) : 1.13  
EDS : 2.25  
buster-report : 1.1.7 (2018)  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
Refmac : 5.8.0158  
CCP4 : 7.0.044 (Gargrove)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.25

# 1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:  
*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.60 Å.

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



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
$R_{free}$	130704	3398 (1.60-1.60)
Clashscore	141614	3665 (1.60-1.60)
Ramachandran outliers	138981	3564 (1.60-1.60)
Sidechain outliers	138945	3563 (1.60-1.60)
RSRZ outliers	127900	3321 (1.60-1.60)

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	207	<div><div>2%</div><div>96%</div><div>.</div></div>
1	B	207	<div><div>7%</div><div>91%</div><div>9%</div></div>
1	C	207	<div><div>%</div><div>92%</div><div>8%</div></div>
1	D	207	<div><div>5%</div><div>94%</div><div>6%</div></div>

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit crite-

ria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
4	SO4	A	404	-	-	-	X

## 2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 7467 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.

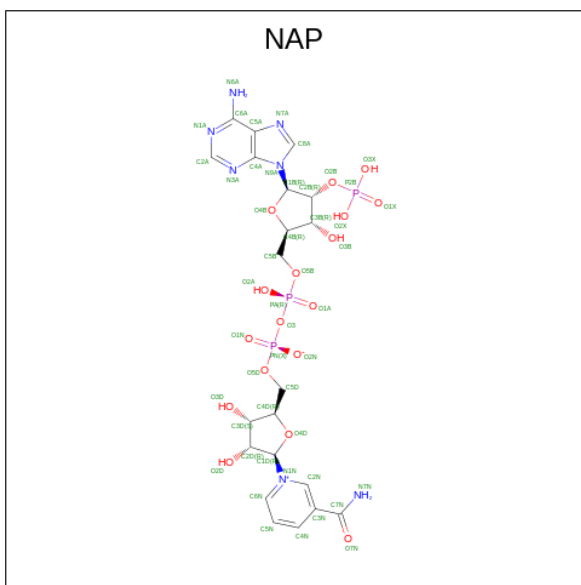
- Molecule 1 is a protein called Flavin reductase (NADPH).

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	207	Total	C	N	O	S	0	4	0
			1585	994	283	300	8			
1	B	206	Total	C	N	O	S	0	2	0
			1565	982	280	295	8			
1	C	207	Total	C	N	O	S	0	6	0
			1598	1002	286	302	8			
1	D	206	Total	C	N	O	S	0	5	0
			1584	994	284	298	8			

There are 4 discrepancies between the modelled and reference sequences:

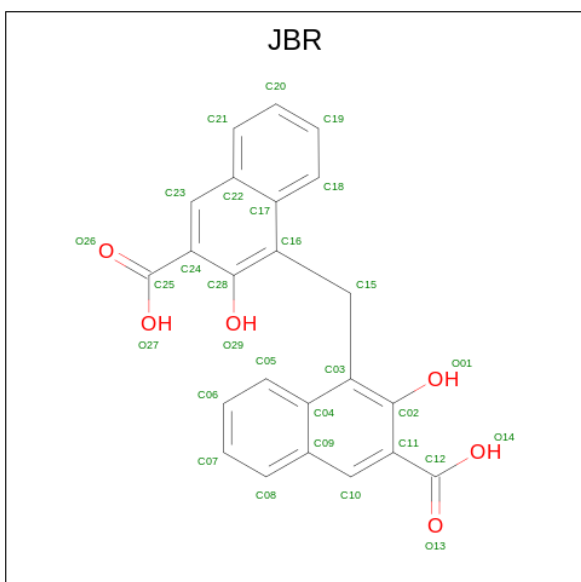
Chain	Residue	Modelled	Actual	Comment	Reference
A	0	HIS	-	expression tag	UNP P30043
B	0	HIS	-	expression tag	UNP P30043
C	0	HIS	-	expression tag	UNP P30043
D	0	HIS	-	expression tag	UNP P30043

- Molecule 2 is NADP NICOTINAMIDE-ADENINE-DINUCLEOTIDE PHOSPHATE (three-letter code: NAP) (formula:  $C_{21}H_{28}N_7O_{17}P_3$ ) (labeled as "Ligand of Interest" by depositor).



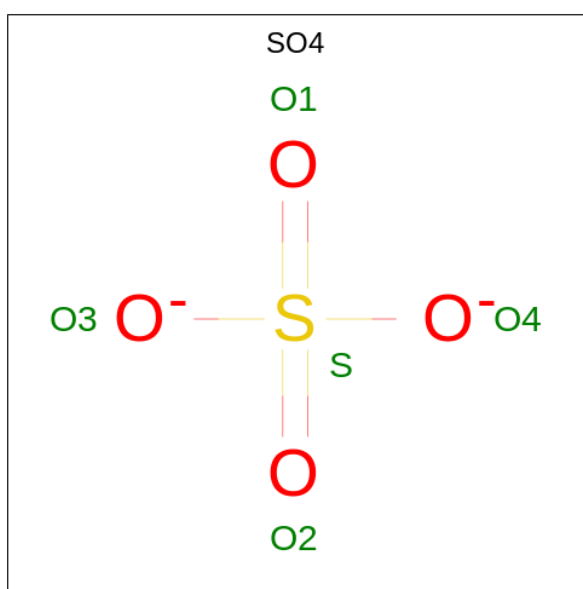
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total 48	C 21	N 7	O 17	P 3	0	0
2	B	1	Total 48	C 21	N 7	O 17	P 3	0	0
2	C	1	Total 48	C 21	N 7	O 17	P 3	0	0
2	D	1	Total 48	C 21	N 7	O 17	P 3	0	0

- Molecule 3 is 4-[(3-carboxy-2-oxidanyl-naphthalen-1-yl)methyl]-3-oxidanyl-naphthalene-2-carboxylic acid (three-letter code: JBR) (formula:  $C_{23}H_{16}O_6$ ) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	C	O	0	0
			29	23	6		
3	A	1	Total	C	O	0	0
			29	23	6		
3	C	1	Total	C	O	0	0
			29	23	6		
3	D	1	Total	C	O	0	0
			29	23	6		

- Molecule 4 is SULFATE ION (three-letter code: SO4) (formula: O<sub>4</sub>S) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	A	1	Total	O	S	0	0
			5	4	1		
4	B	1	Total	O	S	0	0
			5	4	1		
4	B	1	Total	O	S	0	0
			5	4	1		
4	C	1	Total	O	S	0	0
			5	4	1		
4	D	1	Total	O	S	0	0
			5	4	1		
4	D	1	Total	O	S	0	0
			5	4	1		
4	D	1	Total	O	S	0	0
			5	4	1		

- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	227	Total 227	O 227	0	0
5	B	159	Total 159	O 159	0	0
5	C	215	Total 215	O 215	0	0
5	D	191	Total 191	O 191	0	0

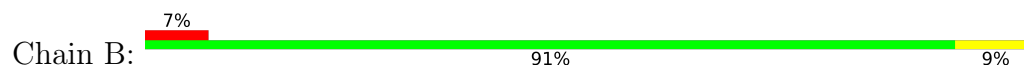
### 3 Residue-property plots [i](#)

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: Flavin reductase (NADPH)



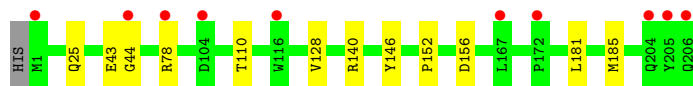
- Molecule 1: Flavin reductase (NADPH)



- Molecule 1: Flavin reductase (NADPH)



- Molecule 1: Flavin reductase (NADPH)





## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	83.98Å 117.38Å 81.97Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	47.72 – 1.60 47.72 – 1.60	Depositor EDS
% Data completeness (in resolution range)	99.6 (47.72-1.60) 99.6 (47.72-1.60)	Depositor EDS
$R_{merge}$	0.09	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.65 (at 1.60Å)	Xtriage
Refinement program	PHENIX 1.19.2	Depositor
R, $R_{free}$	0.171 , 0.198 0.171 , 0.198	Depositor DCC
$R_{free}$ test set	1999 reflections (1.87%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	15.4	Xtriage
Anisotropy	0.435	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.36 , 49.2	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.47$ , $\langle L^2 \rangle = 0.30$	Xtriage
Estimated twinning fraction	0.000 for l,-k,h	Xtriage
$F_o, F_c$ correlation	0.97	EDS
Total number of atoms	7467	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	23.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 91.76 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 1.2865e-08. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

<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, SO4, JBR

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	0.45	0/1629	0.61	0/2218
1	B	0.36	0/1602	0.57	0/2181
1	C	0.46	0/1648	0.63	1/2243 (0.0%)
1	D	0.38	0/1630	0.57	0/2218
All	All	0.42	0/6509	0.59	1/8860 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	63	LYS	CD-CE-NZ	5.12	123.47	111.70

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	1585	0	1601	6	0
1	B	1565	0	1586	12	0
1	C	1598	0	1618	13	0
1	D	1584	0	1611	10	0
2	A	48	0	25	1	0
2	B	48	0	23	2	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	C	48	0	24	1	0
2	D	48	0	25	1	0
3	A	58	0	0	1	0
3	C	29	0	0	3	0
3	D	29	0	0	0	0
4	A	5	0	0	1	0
4	B	10	0	0	0	0
4	C	5	0	0	1	0
4	D	15	0	0	1	0
5	A	227	0	0	0	1
5	B	159	0	0	4	2
5	C	215	0	0	2	5
5	D	191	0	0	5	4
All	All	7467	0	6513	40	6

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

All (40) 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:A:170:ARG:NH1	4:A:404:SO4:O1	2.11	0.81
1:B:126[B]:GLN:OE1	5:B:501:HOH:O	2.12	0.67
1:C:157:GLN:HE22	1:C:175:VAL:HG21	1.62	0.63
1:D:25[B]:GLN:OE1	5:D:501:HOH:O	2.17	0.58
1:B:187:ARG:NH2	5:B:506:HOH:O	2.32	0.58
4:D:403:SO4:O2	5:D:503:HOH:O	2.17	0.58
1:B:112:ALA:O	1:B:116:TRP:HD1	1.92	0.53
1:B:168:ASP:HA	1:B:198:SER:OG	2.09	0.52
1:B:140:ARG:NH1	5:B:503:HOH:O	2.29	0.52
1:C:156[A]:ASP:OD2	5:C:501:HOH:O	2.19	0.51
1:D:78[B]:ARG:NH1	5:D:502:HOH:O	2.17	0.50
1:C:116:TRP:HH2	3:C:402:JBR:C06	2.25	0.49
1:D:78[B]:ARG:NH2	5:D:506:HOH:O	2.30	0.49
1:C:137:LYS:HE2	1:D:156:ASP:OD1	2.13	0.48
1:D:181:LEU:O	1:D:185:MET:HG2	2.13	0.48
1:D:128:VAL:HG23	5:D:558:HOH:O	2.14	0.48
1:C:153:HIS:HB2	3:C:402:JBR:O01	2.14	0.48
1:A:153:HIS:HB2	3:A:402:JBR:O29	2.13	0.47
1:B:173:SER:HB2	1:B:202:SER:HB2	1.96	0.47
1:A:181:LEU:O	1:A:185:MET:HG2	2.15	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:43:GLU:CD	1:D:44:GLY:H	2.18	0.46
1:B:78:ARG:HG2	2:B:401:NAP:O1A	2.15	0.46
1:A:76:GLY:O	2:A:401:NAP:H8A	2.16	0.46
1:B:76:GLY:O	2:B:401:NAP:H8A	2.16	0.45
1:C:41:PRO:HB2	1:C:43:GLU:HG2	2.00	0.44
1:A:41:PRO:O	1:A:46:ARG:NH2	2.51	0.44
1:B:181:LEU:O	1:B:185:MET:HG2	2.17	0.44
1:A:137:LYS:HE2	1:B:156:ASP:OD1	2.18	0.43
1:B:77:THR:HG22	1:C:37:SER:CB	2.49	0.43
1:C:174:ARG:HG3	4:C:403:SO4:O2	2.19	0.43
1:B:126[B]:GLN:NE2	5:B:514:HOH:O	2.47	0.42
1:D:110:THR:O	2:D:401:NAP:H6N	2.19	0.42
1:D:140:ARG:HG2	1:D:146:TYR:HE2	1.85	0.42
1:C:181:LEU:O	1:C:185:MET:HG2	2.20	0.42
1:C:46:ARG:NE	1:C:46:ARG:HA	2.36	0.41
1:D:140:ARG:HG2	1:D:146:TYR:CE2	2.56	0.41
1:C:25[B]:GLN:HG2	5:C:574:HOH:O	2.20	0.41
1:C:39[B]:ARG:HE	1:C:39[B]:ARG:HB3	1.58	0.41
1:C:116:TRP:CH2	3:C:402:JBR:C06	3.04	0.40
2:C:401:NAP:H2D	2:C:401:NAP:H2N	1.87	0.40

All (6) 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)
5:C:667:HOH:O	5:D:625:HOH:O[3_544]	2.00	0.20
5:C:562:HOH:O	5:D:676:HOH:O[4_545]	2.08	0.12
5:C:630:HOH:O	5:D:676:HOH:O[4_545]	2.09	0.11
5:B:521:HOH:O	5:C:554:HOH:O[4_445]	2.11	0.09
5:A:713:HOH:O	5:B:608:HOH:O[3_555]	2.12	0.08
5:C:684:HOH:O	5:D:648:HOH:O[3_544]	2.16	0.04

## 5.3 Torsion angles ⓘ

### 5.3.1 Protein backbone ⓘ

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	209/207 (101%)	205 (98%)	3 (1%)	1 (0%)	29	11
1	B	206/207 (100%)	202 (98%)	3 (2%)	1 (0%)	29	11
1	C	211/207 (102%)	206 (98%)	4 (2%)	1 (0%)	29	11
1	D	209/207 (101%)	205 (98%)	3 (1%)	1 (0%)	29	11
All	All	835/828 (101%)	818 (98%)	13 (2%)	4 (0%)	29	11

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	152	PRO
1	C	152	PRO
1	B	152	PRO
1	D	152	PRO

### 5.3.2 Protein sidechains ⓘ

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	174/170 (102%)	174 (100%)	0	100	100
1	B	171/170 (101%)	169 (99%)	2 (1%)	71	54
1	C	176/170 (104%)	176 (100%)	0	100	100
1	D	174/170 (102%)	174 (100%)	0	100	100
All	All	695/680 (102%)	693 (100%)	2 (0%)	92	87

All (2) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	46	ARG
1	B	111	SER

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are

no such sidechains identified.

### 5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

## 5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

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

## 5.5 Carbohydrates ⓘ

There are no monosaccharides in this entry.

## 5.6 Ligand geometry ⓘ

15 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$
2	NAP	D	401	-	45,52,52	4.31	14 (31%)	56,80,80	1.73	10 (17%)
4	SO4	D	403	-	4,4,4	0.20	0	6,6,6	0.24	0
4	SO4	D	405	-	4,4,4	0.13	0	6,6,6	0.12	0
4	SO4	A	404	-	4,4,4	0.13	0	6,6,6	0.25	0
2	NAP	B	401	-	45,52,52	4.34	15 (33%)	56,80,80	1.81	8 (14%)
4	SO4	B	402	-	4,4,4	0.12	0	6,6,6	0.18	0
4	SO4	B	403	-	4,4,4	0.16	0	6,6,6	0.05	0
3	JBR	D	402	-	28,32,32	2.03	4 (14%)	37,47,47	1.29	5 (13%)
2	NAP	C	401	-	45,52,52	3.68	11 (24%)	56,80,80	1.70	7 (12%)
3	JBR	A	402	-	28,32,32	1.94	4 (14%)	37,47,47	1.08	2 (5%)
4	SO4	D	404	-	4,4,4	0.14	0	6,6,6	0.11	0
2	NAP	A	401	-	45,52,52	3.54	11 (24%)	56,80,80	1.80	8 (14%)
3	JBR	A	403	-	28,32,32	1.94	4 (14%)	37,47,47	1.39	6 (16%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
4	SO4	C	403	-	4,4,4	0.13	0	6,6,6	0.09	0
3	JBR	C	402	-	28,32,32	1.94	4 (14%)	37,47,47	1.03	1 (2%)

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
2	NAP	D	401	-	-	6/31/67/67	0/5/5/5
2	NAP	B	401	-	-	7/31/67/67	0/5/5/5
3	JBR	D	402	-	-	2/4/12/12	0/4/4/4
2	NAP	C	401	-	-	6/31/67/67	0/5/5/5
3	JBR	A	402	-	-	0/4/12/12	0/4/4/4
2	NAP	A	401	-	-	6/31/67/67	0/5/5/5
3	JBR	A	403	-	-	2/4/12/12	0/4/4/4
3	JBR	C	402	-	-	0/4/12/12	0/4/4/4

All (67) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	401	NAP	C2D-C1D	-15.06	1.30	1.53
2	D	401	NAP	C2D-C1D	-14.98	1.31	1.53
2	B	401	NAP	O4D-C1D	14.69	1.61	1.41
2	D	401	NAP	O4D-C1D	14.38	1.61	1.41
2	D	401	NAP	O4B-C1B	13.91	1.60	1.41
2	B	401	NAP	O4B-C1B	13.83	1.60	1.41
2	C	401	NAP	C2D-C1D	-13.10	1.33	1.53
2	A	401	NAP	C2D-C1D	-12.45	1.34	1.53
2	A	401	NAP	O4D-C1D	11.82	1.57	1.41
2	C	401	NAP	O4D-C1D	11.37	1.56	1.41
2	C	401	NAP	O4B-C1B	10.80	1.56	1.41
2	A	401	NAP	O4B-C1B	9.38	1.54	1.41
2	D	401	NAP	C7N-N7N	7.65	1.47	1.33
2	C	401	NAP	C7N-N7N	7.49	1.47	1.33
2	B	401	NAP	C7N-N7N	7.36	1.47	1.33
2	A	401	NAP	C7N-N7N	7.22	1.46	1.33
3	D	402	JBR	C24-C25	6.75	1.54	1.47
3	A	402	JBR	C11-C12	6.47	1.53	1.47
3	A	403	JBR	C11-C12	6.27	1.53	1.47
3	D	402	JBR	C11-C12	6.27	1.53	1.47

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	C	402	JBR	C24-C25	6.26	1.53	1.47
3	A	403	JBR	C24-C25	5.94	1.53	1.47
3	A	402	JBR	C24-C25	5.86	1.53	1.47
3	C	402	JBR	C11-C12	5.84	1.53	1.47
2	B	401	NAP	O4D-C4D	-5.23	1.33	1.45
2	B	401	NAP	O4B-C4B	-5.19	1.33	1.45
2	D	401	NAP	O4B-C4B	-5.13	1.33	1.45
2	D	401	NAP	O4D-C4D	-5.00	1.33	1.45
2	A	401	NAP	O4D-C4D	-4.69	1.34	1.45
2	C	401	NAP	O4D-C4D	-4.57	1.34	1.45
2	A	401	NAP	P2B-O2B	4.56	1.67	1.59
2	C	401	NAP	C2A-N3A	4.52	1.39	1.32
2	B	401	NAP	P2B-O2B	4.46	1.67	1.59
2	D	401	NAP	P2B-O2B	4.36	1.67	1.59
2	C	401	NAP	O4B-C4B	-4.24	1.35	1.45
2	A	401	NAP	C2A-N3A	3.70	1.38	1.32
2	A	401	NAP	O4B-C4B	-3.70	1.36	1.45
2	C	401	NAP	P2B-O2B	3.70	1.66	1.59
2	D	401	NAP	C2A-N3A	3.68	1.38	1.32
2	B	401	NAP	C2A-N3A	3.54	1.37	1.32
2	B	401	NAP	O3B-C3B	-2.82	1.36	1.43
2	B	401	NAP	O3D-C3D	-2.76	1.36	1.43
2	C	401	NAP	O3B-C3B	-2.73	1.36	1.43
3	C	402	JBR	C04-C09	-2.69	1.38	1.43
2	D	401	NAP	O3B-C3B	-2.52	1.37	1.43
2	D	401	NAP	O3D-C3D	-2.50	1.37	1.43
3	C	402	JBR	C17-C22	-2.44	1.38	1.43
3	A	403	JBR	C04-C09	-2.42	1.38	1.43
2	A	401	NAP	C2N-C3N	2.41	1.42	1.39
3	A	402	JBR	C04-C09	-2.35	1.38	1.43
3	D	402	JBR	C04-C09	-2.34	1.38	1.43
2	B	401	NAP	C5A-C4A	-2.34	1.34	1.40
3	A	402	JBR	C17-C22	-2.32	1.38	1.43
3	A	403	JBR	C17-C22	-2.29	1.38	1.43
2	A	401	NAP	O3B-C3B	-2.22	1.37	1.43
2	B	401	NAP	C4N-C3N	-2.22	1.35	1.39
3	D	402	JBR	C17-C22	-2.20	1.39	1.43
2	A	401	NAP	C5A-C4A	-2.17	1.35	1.40
2	D	401	NAP	C4N-C3N	-2.16	1.35	1.39
2	D	401	NAP	O2D-C2D	2.15	1.48	1.43
2	D	401	NAP	C5A-C4A	-2.14	1.35	1.40
2	D	401	NAP	C6A-N6A	2.14	1.41	1.34

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	C	401	NAP	C4N-C3N	-2.12	1.35	1.39
2	B	401	NAP	O7N-C7N	-2.09	1.20	1.24
2	B	401	NAP	C6A-N6A	2.07	1.41	1.34
2	B	401	NAP	O2D-C2D	2.03	1.47	1.43
2	C	401	NAP	O3D-C3D	-2.02	1.38	1.43

All (47) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	D	401	NAP	C5A-C6A-N6A	6.77	130.65	120.35
2	B	401	NAP	C5A-C6A-N6A	6.75	130.61	120.35
2	C	401	NAP	C5A-C6A-N6A	6.07	129.57	120.35
2	A	401	NAP	N3A-C2A-N1A	-6.03	119.26	128.68
2	A	401	NAP	C5A-C6A-N6A	5.96	129.41	120.35
2	B	401	NAP	N3A-C2A-N1A	-5.82	119.58	128.68
2	D	401	NAP	N3A-C2A-N1A	-5.64	119.87	128.68
2	C	401	NAP	N3A-C2A-N1A	-5.54	120.02	128.68
2	B	401	NAP	N6A-C6A-N1A	-4.74	108.73	118.57
2	B	401	NAP	C1B-N9A-C4A	-4.55	118.65	126.64
2	D	401	NAP	N6A-C6A-N1A	-4.39	109.45	118.57
2	A	401	NAP	C1B-N9A-C4A	-4.03	119.56	126.64
2	A	401	NAP	N6A-C6A-N1A	-3.86	110.56	118.57
2	D	401	NAP	C1B-N9A-C4A	-3.81	119.94	126.64
2	A	401	NAP	O4B-C1B-C2B	-3.79	100.01	106.59
2	C	401	NAP	N6A-C6A-N1A	-3.68	110.94	118.57
2	C	401	NAP	C1B-N9A-C4A	-3.66	120.22	126.64
2	C	401	NAP	O4D-C1D-C2D	-3.27	102.14	106.93
3	A	403	JBR	C15-C03-C02	3.17	122.78	119.53
3	D	402	JBR	C15-C03-C02	3.16	122.78	119.53
2	A	401	NAP	O4D-C1D-C2D	-3.15	102.33	106.93
2	C	401	NAP	O4B-C1B-C2B	-3.11	101.19	106.59
2	A	401	NAP	C6N-N1N-C2N	-3.01	119.23	121.97
2	A	401	NAP	C2N-C3N-C4N	2.91	121.55	118.26
2	B	401	NAP	C6N-N1N-C2N	-2.91	119.33	121.97
2	B	401	NAP	C2N-C3N-C4N	2.87	121.51	118.26
3	A	403	JBR	O01-C02-C03	2.78	121.65	118.68
2	C	401	NAP	C6N-N1N-C2N	-2.78	119.44	121.97
3	A	403	JBR	C15-C03-C04	-2.65	118.79	121.70
3	D	402	JBR	C15-C03-C04	-2.57	118.88	121.70
3	D	402	JBR	O01-C02-C03	2.51	121.36	118.68
2	B	401	NAP	PN-O3-PA	-2.50	124.24	132.83
2	D	401	NAP	C6N-N1N-C2N	-2.49	119.71	121.97

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	C	402	JBR	C16-C15-C03	-2.37	111.37	115.98
3	A	402	JBR	C08-C09-C10	-2.36	117.86	122.02
2	D	401	NAP	C2N-C3N-C4N	2.35	120.93	118.26
3	D	402	JBR	C10-C11-C02	2.34	120.80	118.52
2	D	401	NAP	O4B-C1B-C2B	-2.34	102.52	106.59
3	A	402	JBR	C16-C15-C03	-2.31	111.49	115.98
2	D	401	NAP	O4D-C1D-C2D	-2.28	103.60	106.93
2	D	401	NAP	PN-O3-PA	-2.24	125.15	132.83
3	A	403	JBR	C24-C28-C16	-2.22	119.92	121.69
3	D	402	JBR	C05-C04-C03	-2.21	119.61	122.71
2	D	401	NAP	C3N-C7N-N7N	2.18	120.37	117.75
2	B	401	NAP	C3N-C7N-N7N	2.17	120.36	117.75
3	A	403	JBR	C23-C24-C28	2.16	120.62	118.52
3	A	403	JBR	C05-C04-C03	-2.15	119.69	122.71

There are no chirality outliers.

All (29) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	401	NAP	O4D-C1D-N1N-C2N
2	A	401	NAP	O4D-C1D-N1N-C6N
2	A	401	NAP	C2D-C1D-N1N-C2N
2	A	401	NAP	C2D-C1D-N1N-C6N
2	B	401	NAP	O4D-C1D-N1N-C2N
2	B	401	NAP	O4D-C1D-N1N-C6N
2	B	401	NAP	C2D-C1D-N1N-C2N
2	B	401	NAP	C2D-C1D-N1N-C6N
2	C	401	NAP	O4D-C1D-N1N-C2N
2	C	401	NAP	O4D-C1D-N1N-C6N
2	C	401	NAP	C2D-C1D-N1N-C2N
2	C	401	NAP	C2D-C1D-N1N-C6N
2	D	401	NAP	O4D-C1D-N1N-C2N
2	D	401	NAP	O4D-C1D-N1N-C6N
2	D	401	NAP	C2D-C1D-N1N-C2N
2	D	401	NAP	C2D-C1D-N1N-C6N
3	D	402	JBR	C04-C03-C15-C16
3	A	403	JBR	C02-C03-C15-C16
3	A	403	JBR	C04-C03-C15-C16
3	D	402	JBR	C02-C03-C15-C16
2	C	401	NAP	C2B-O2B-P2B-O1X
2	A	401	NAP	C2B-O2B-P2B-O1X
2	B	401	NAP	C2B-O2B-P2B-O1X

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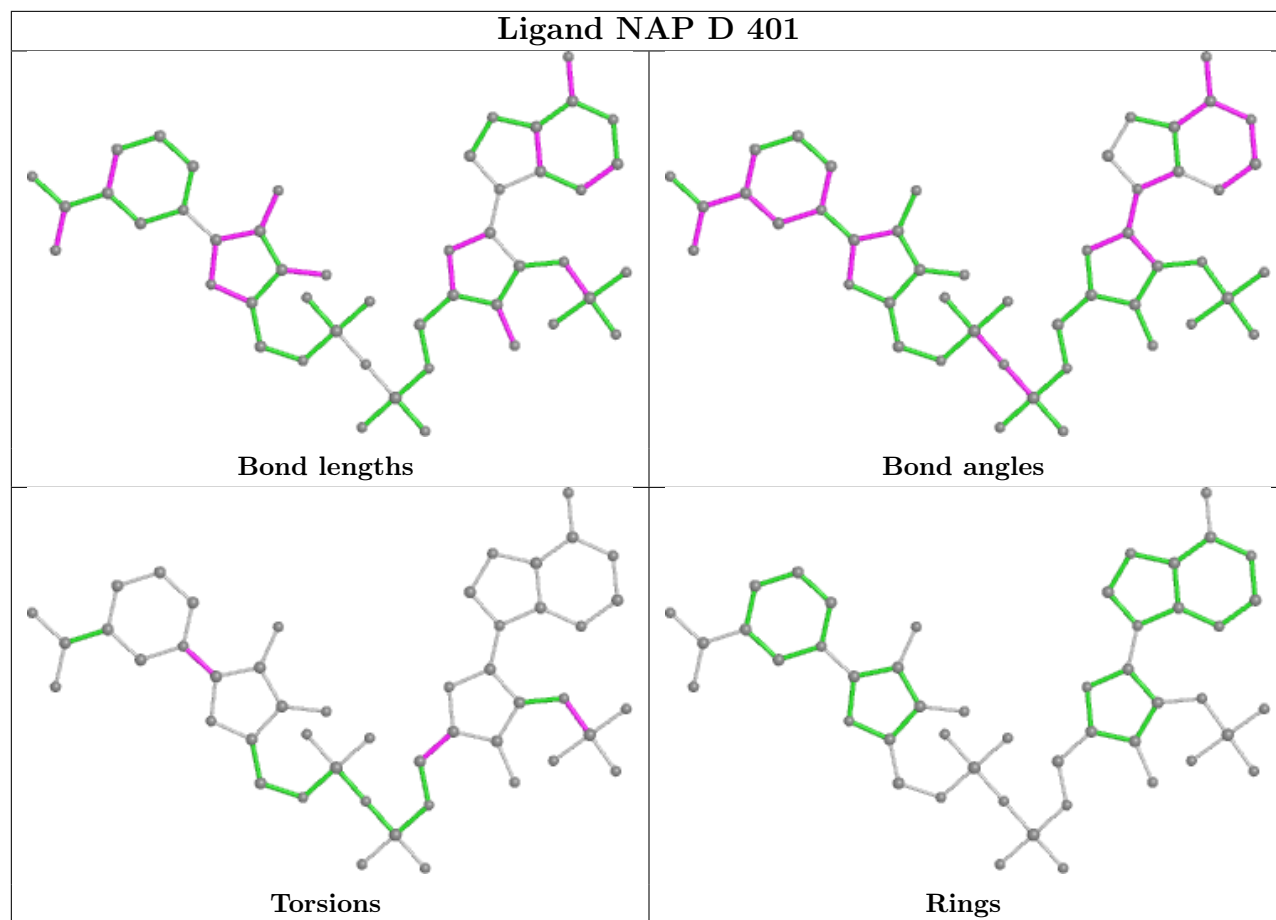
Mol	Chain	Res	Type	Atoms
2	C	401	NAP	O4B-C4B-C5B-O5B
2	B	401	NAP	C2B-O2B-P2B-O2X
2	D	401	NAP	C2B-O2B-P2B-O2X
2	A	401	NAP	O4B-C4B-C5B-O5B
2	B	401	NAP	O4B-C4B-C5B-O5B
2	D	401	NAP	O4B-C4B-C5B-O5B

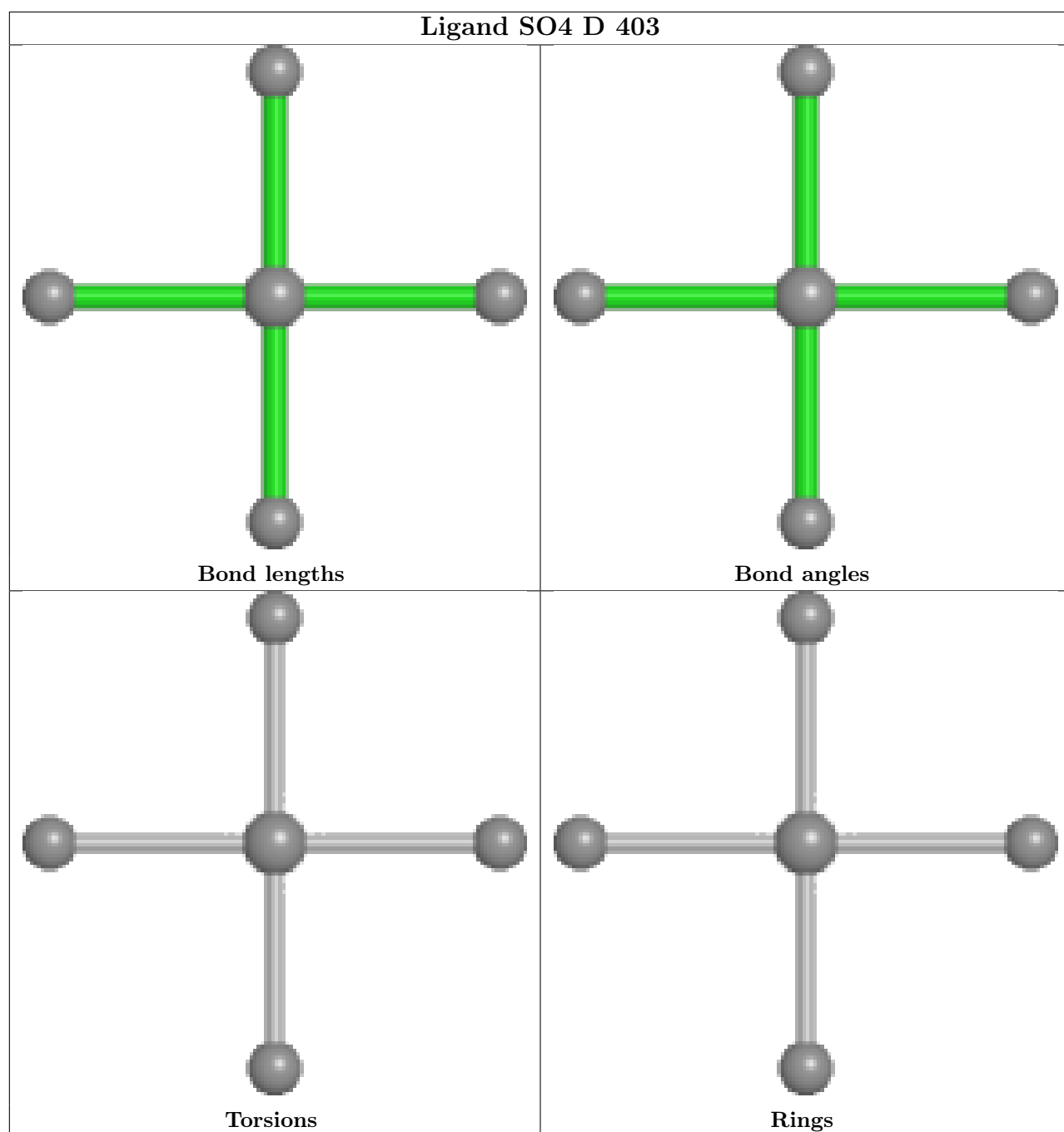
There are no ring outliers.

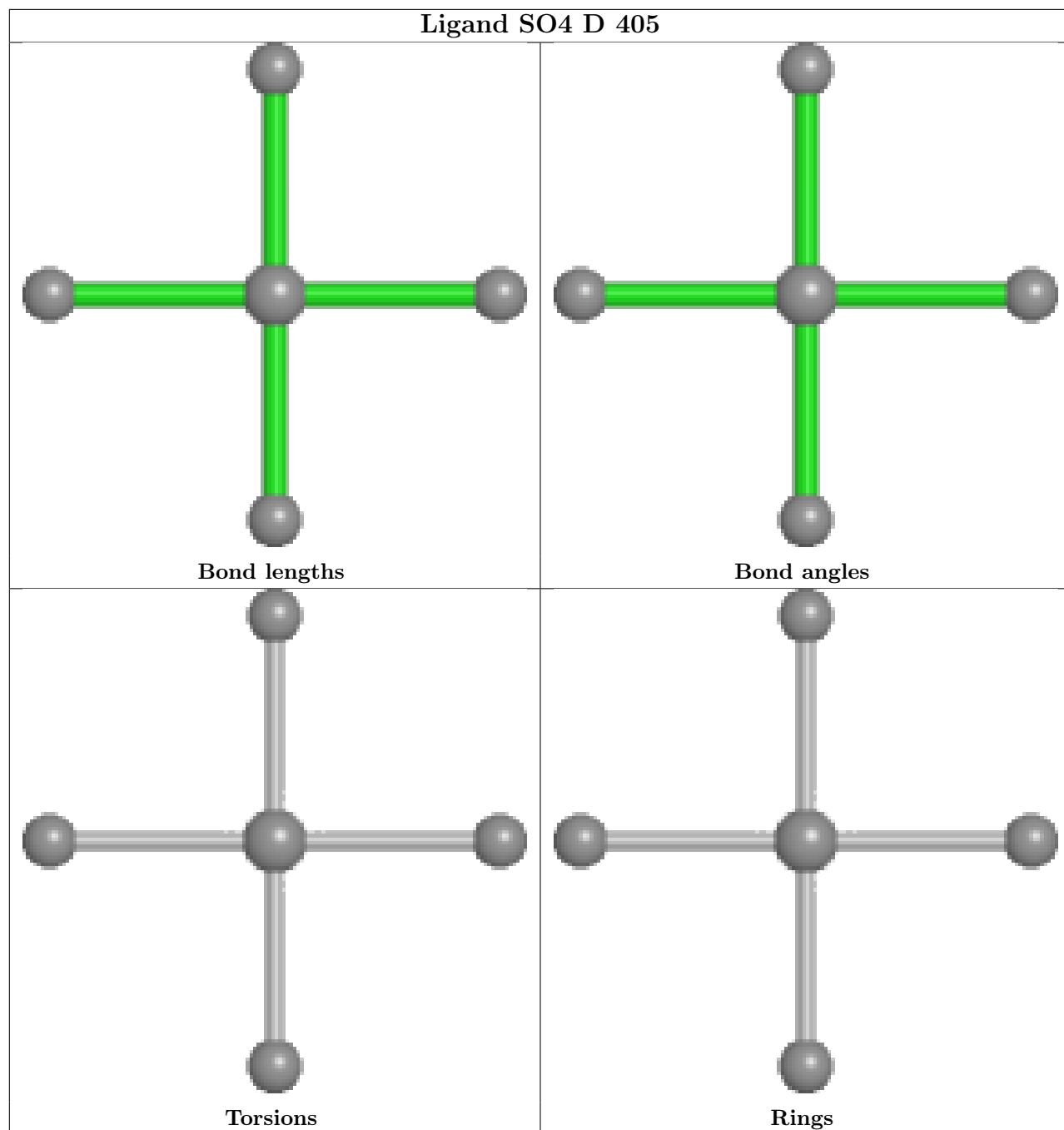
9 monomers are involved in 12 short contacts:

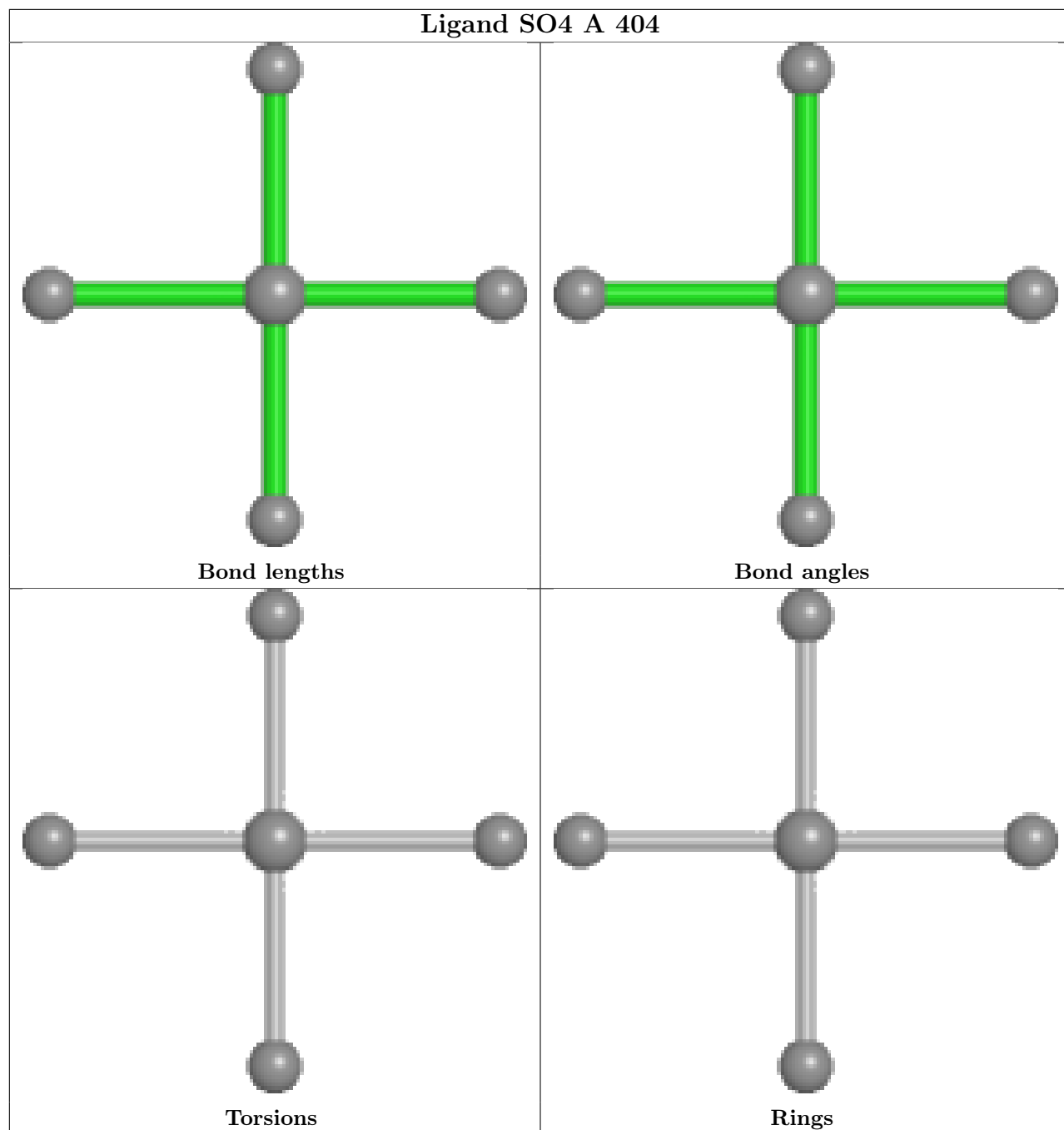
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	D	401	NAP	1	0
4	D	403	SO4	1	0
4	A	404	SO4	1	0
2	B	401	NAP	2	0
2	C	401	NAP	1	0
3	A	402	JBR	1	0
2	A	401	NAP	1	0
4	C	403	SO4	1	0
3	C	402	JBR	3	0

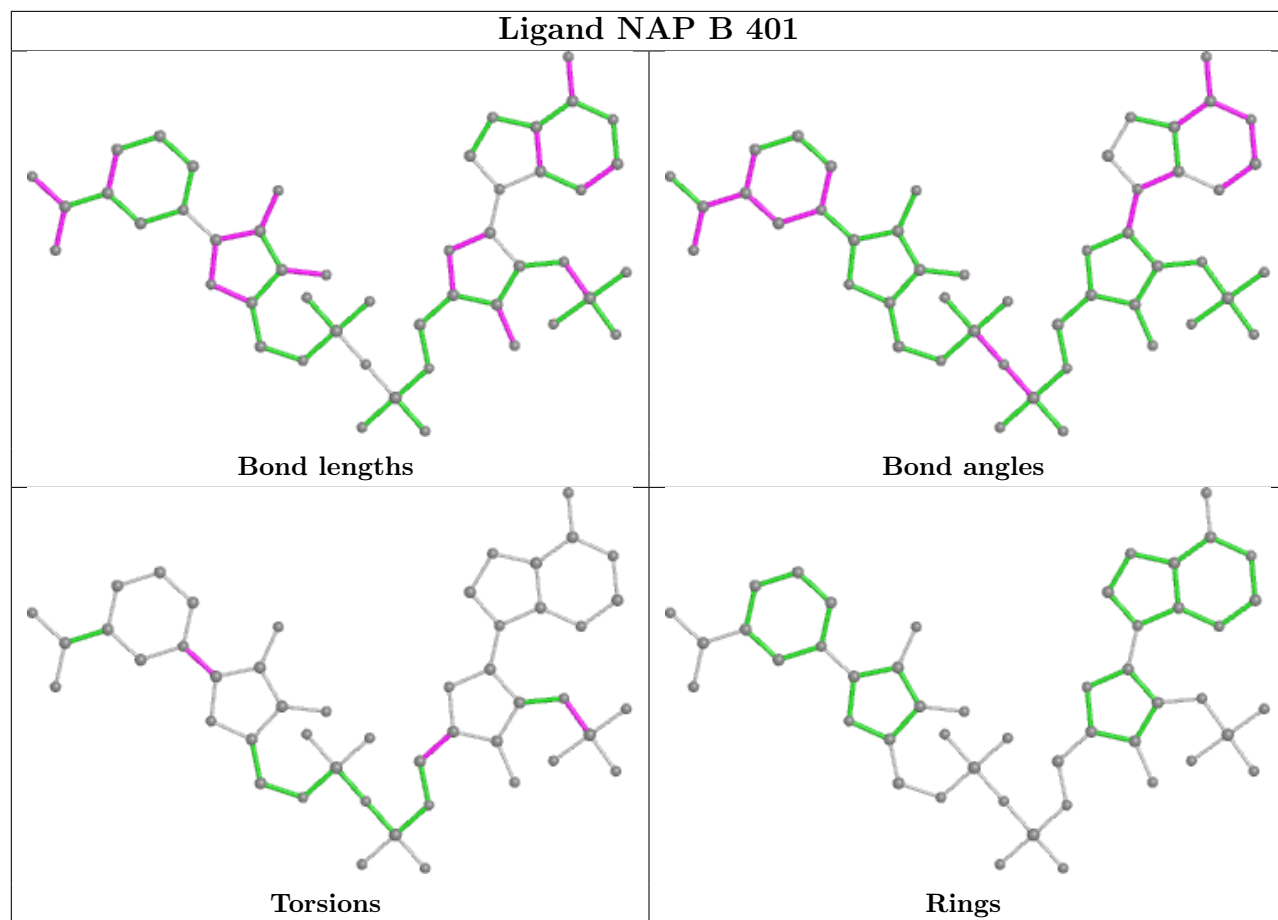
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included.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



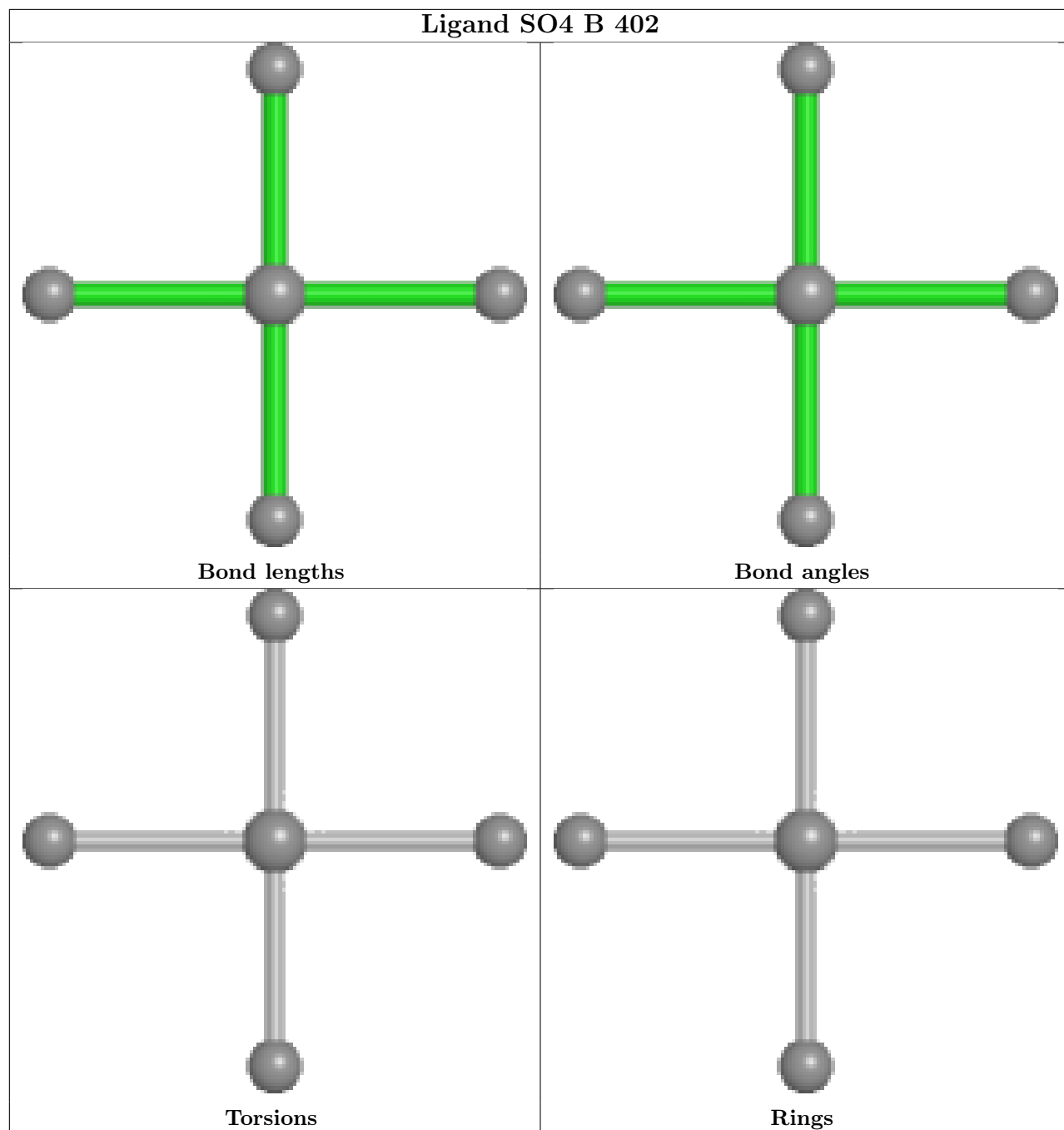


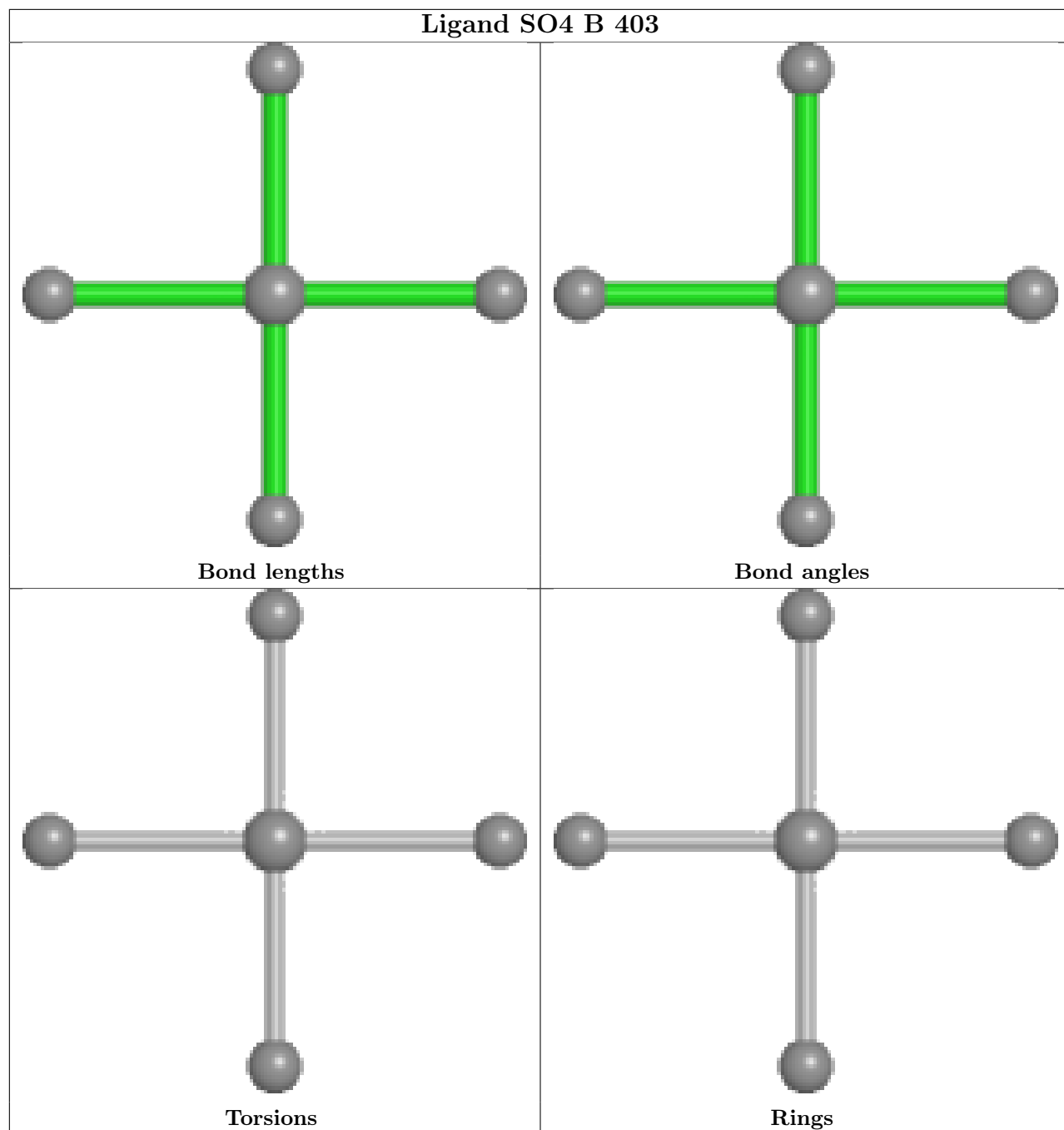


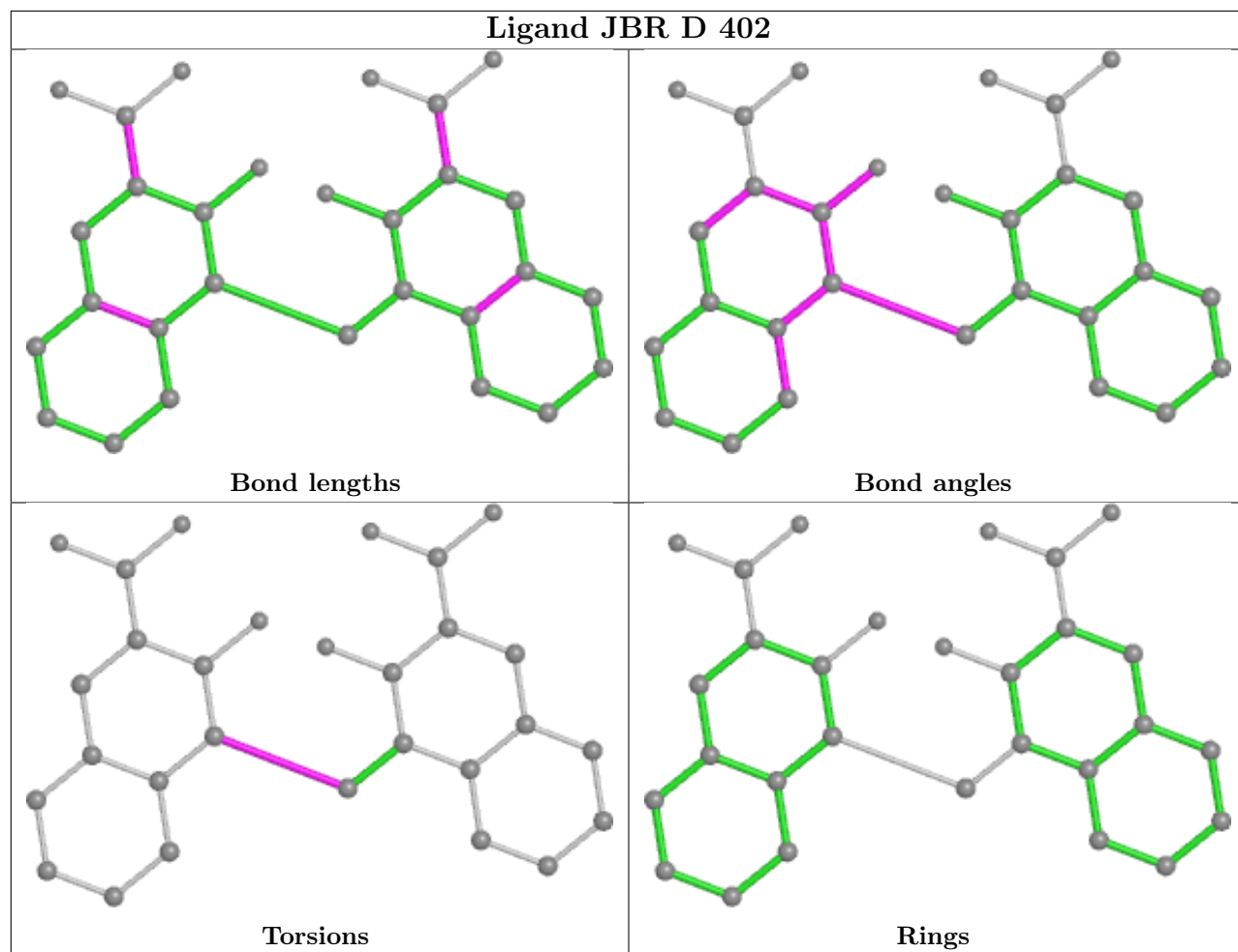


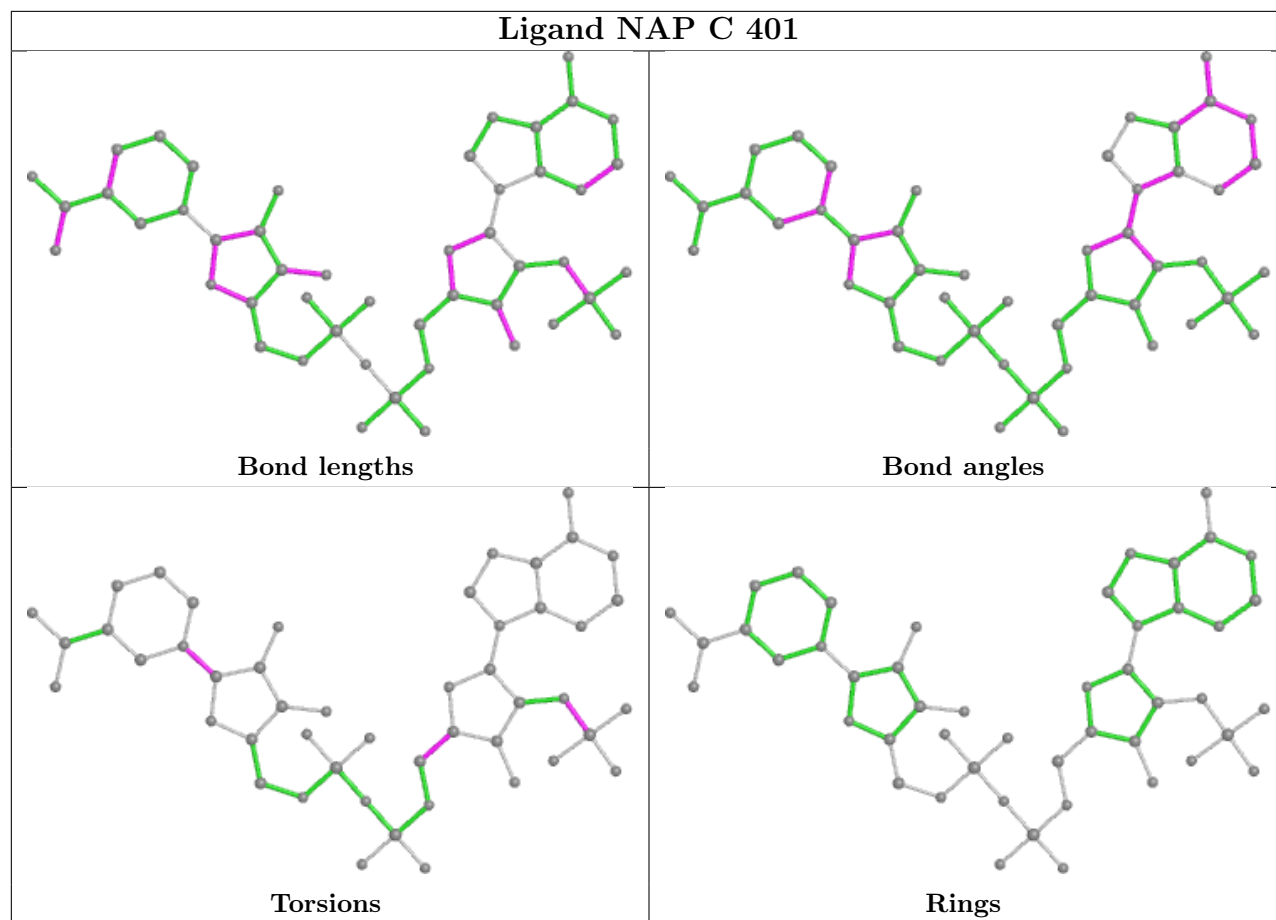


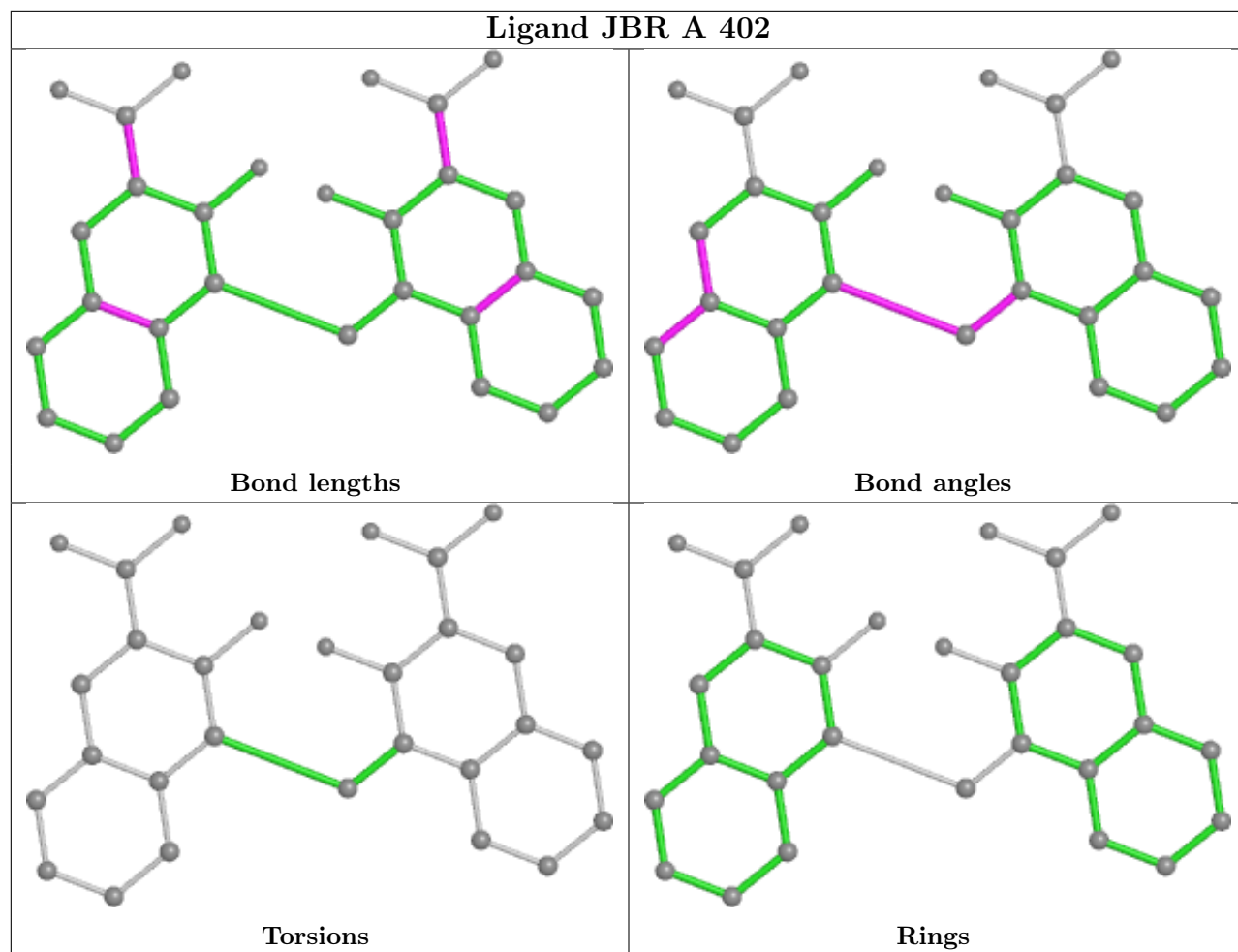


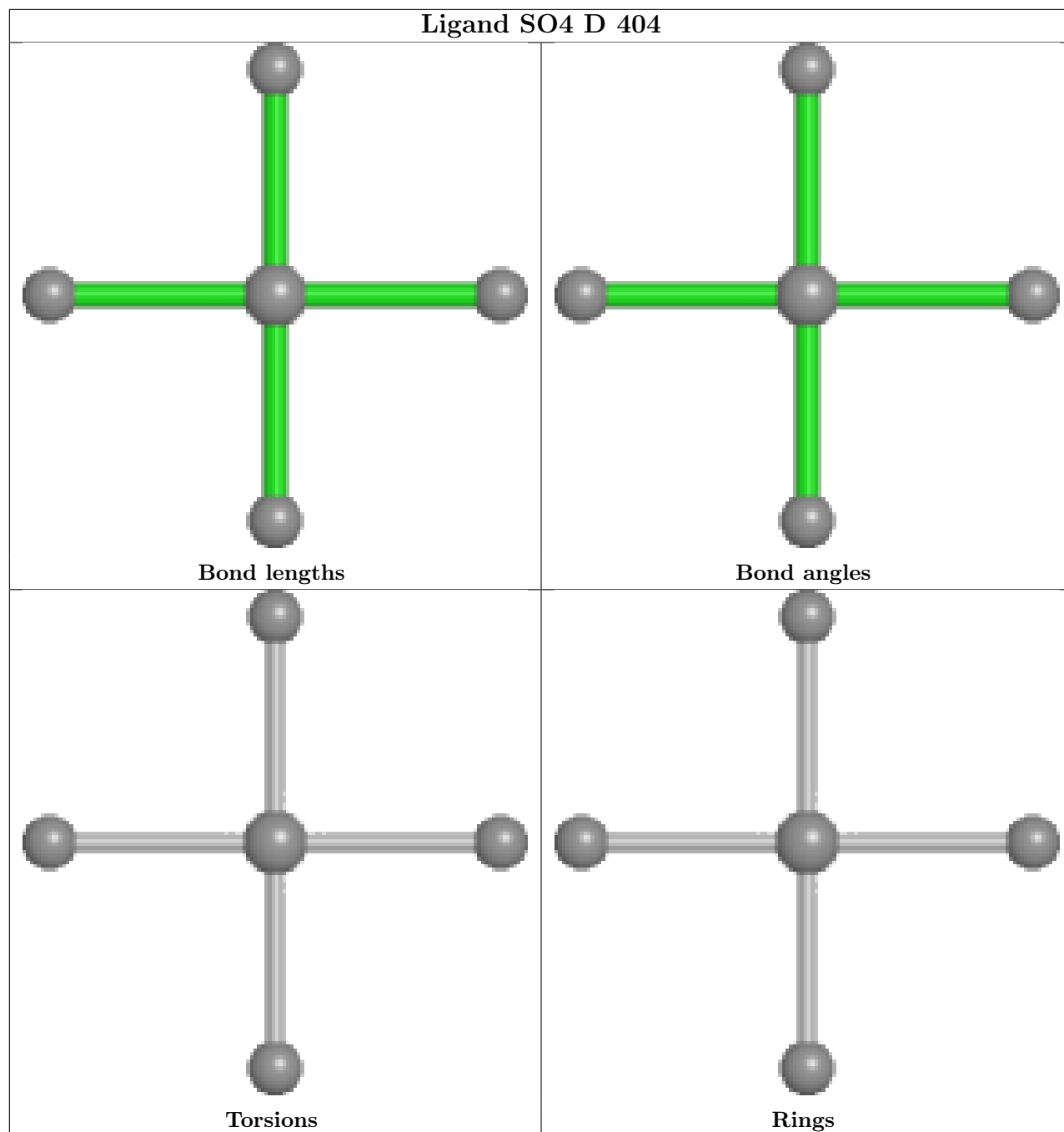


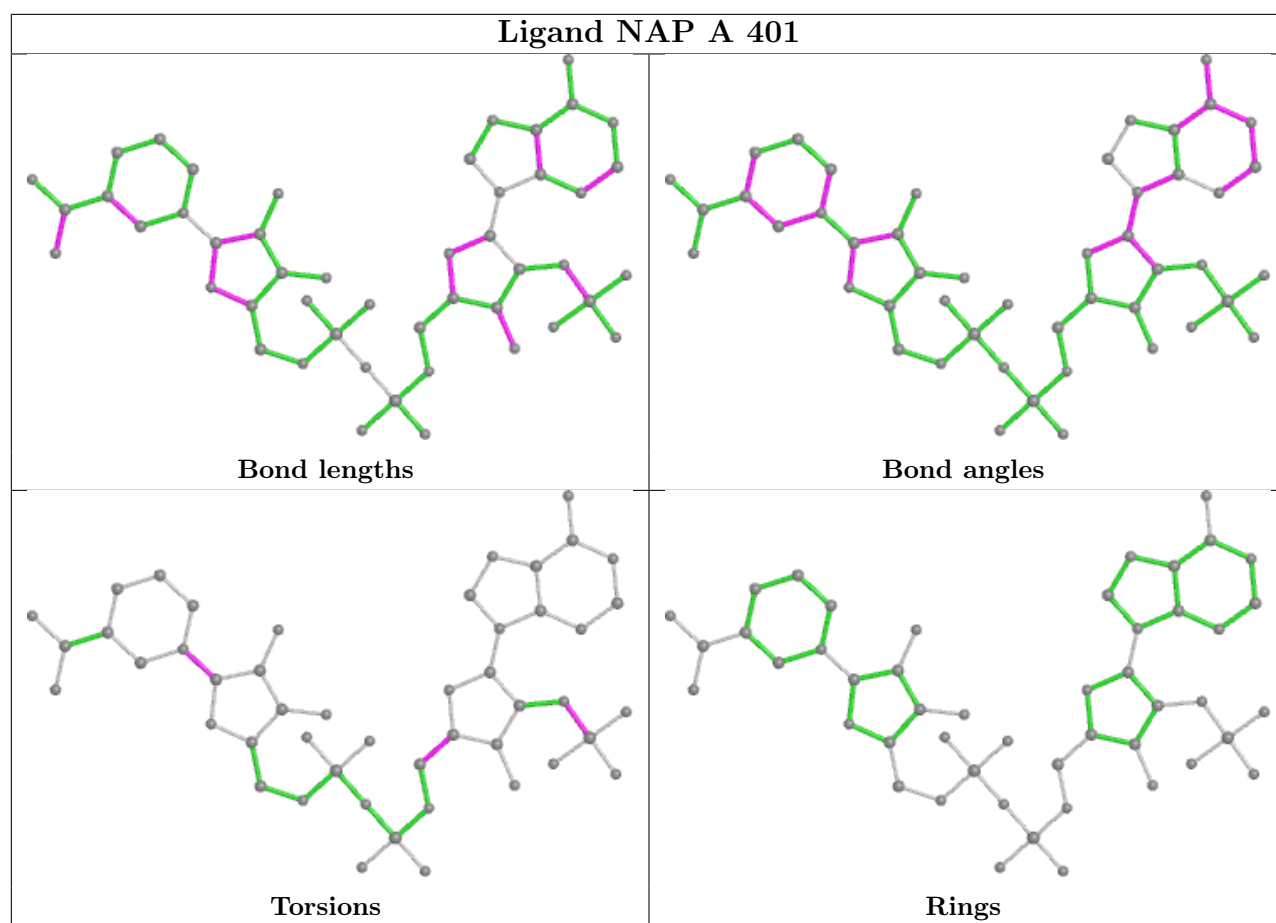


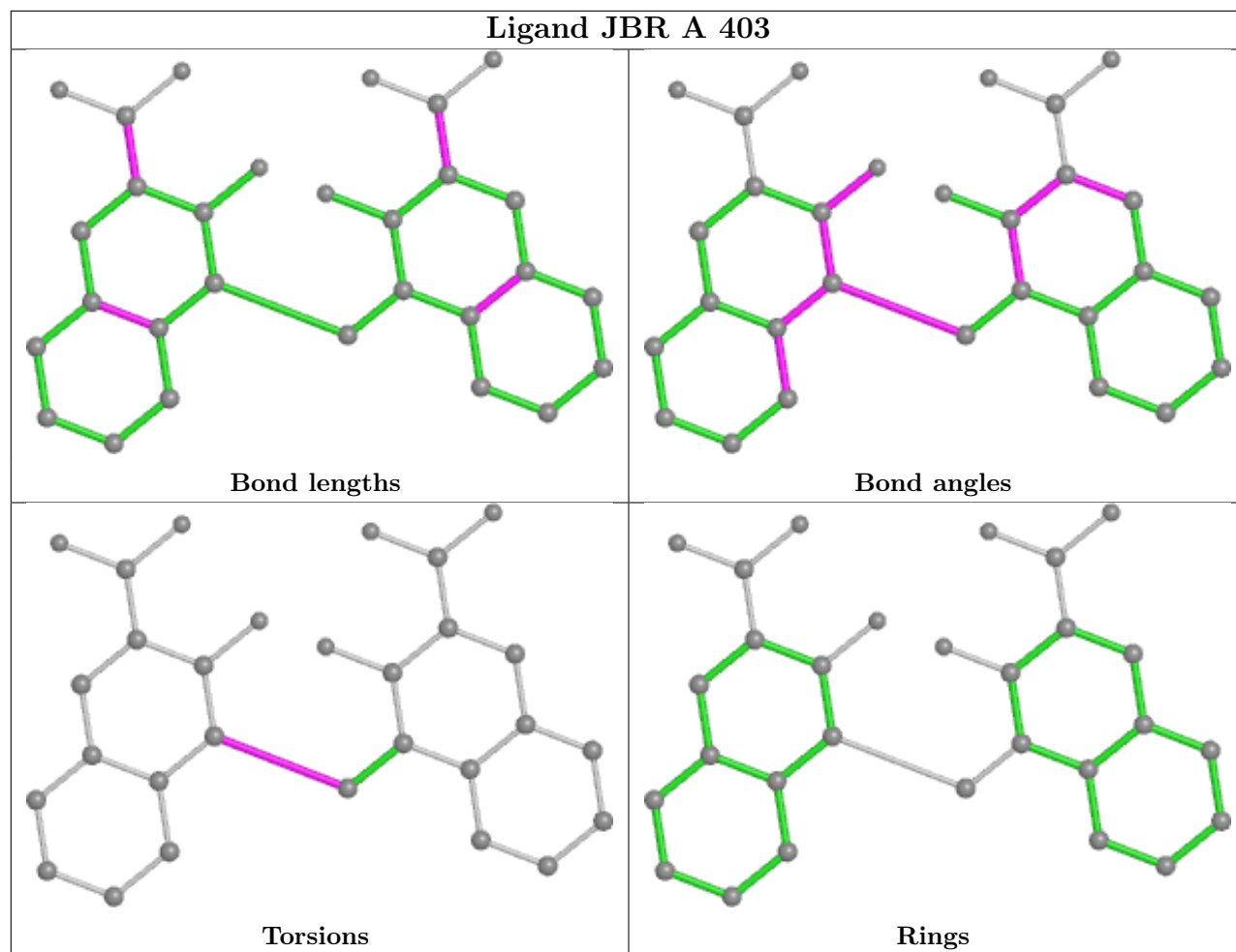




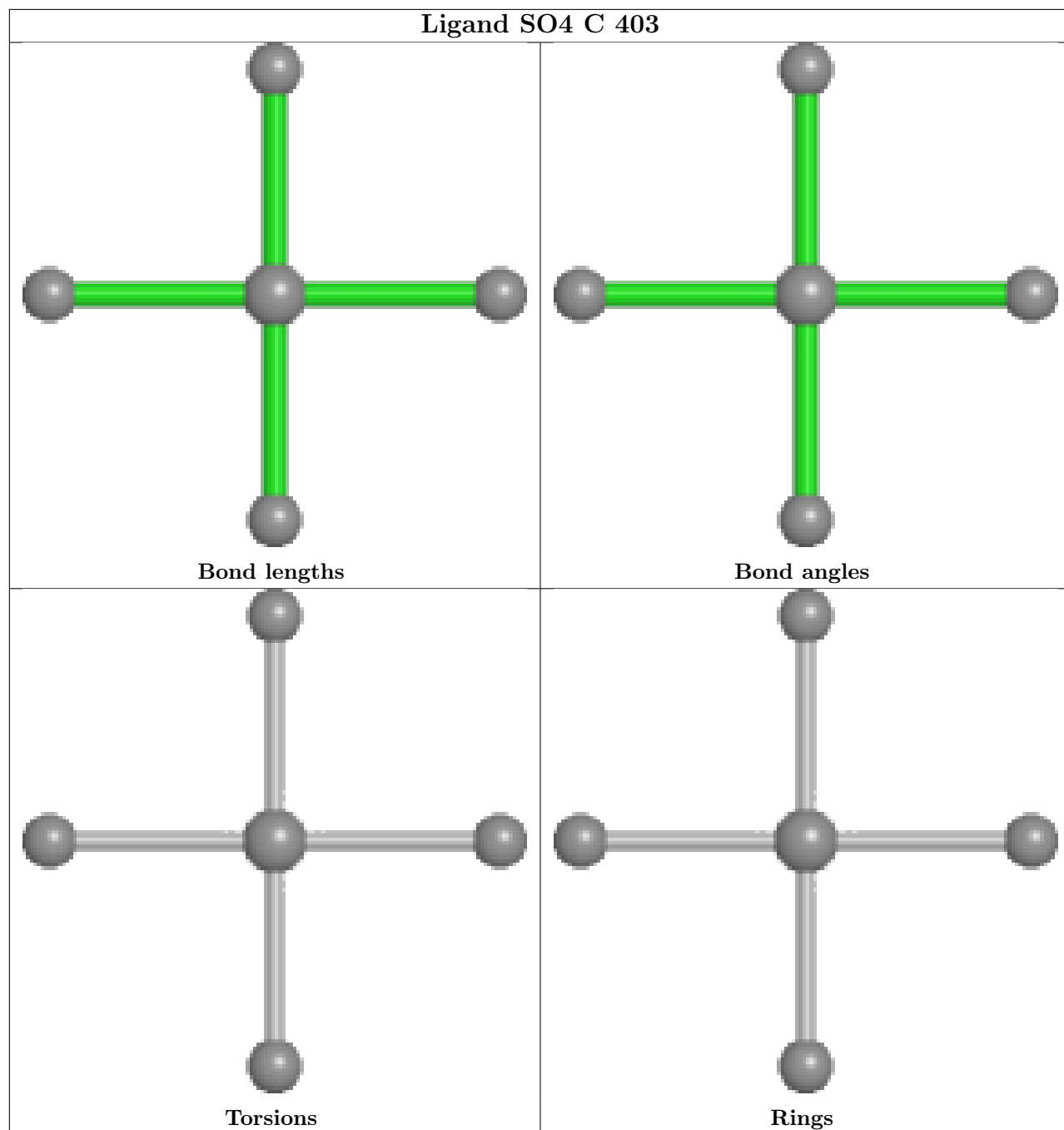


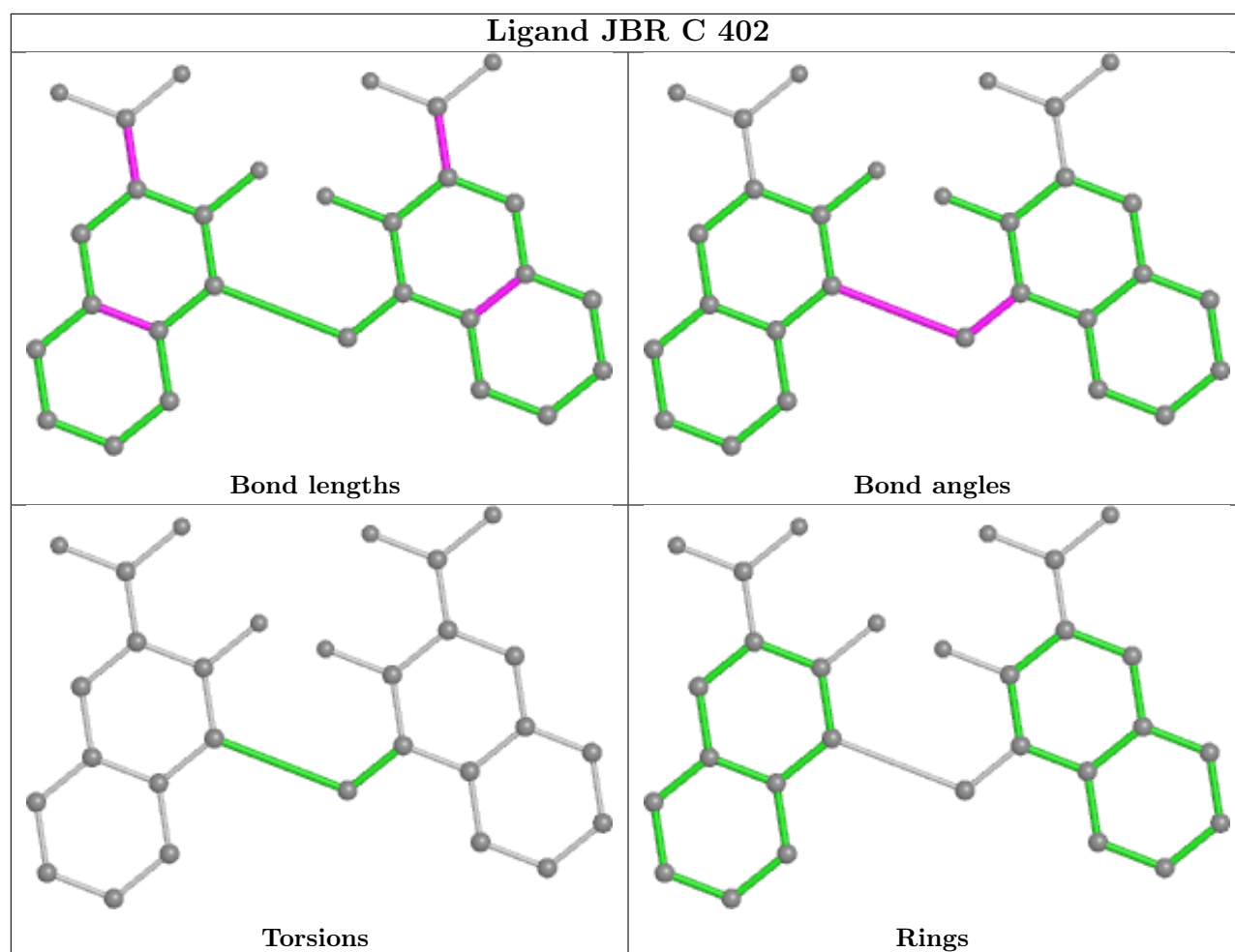












## 5.7 Other polymers [i](#)

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	207/207 (100%)	-0.24	4 (1%) 66 65	8, 14, 35, 76	0
1	B	206/207 (99%)	0.17	15 (7%) 15 13	13, 24, 48, 89	0
1	C	207/207 (100%)	-0.23	3 (1%) 75 75	8, 13, 36, 63	0
1	D	206/207 (99%)	-0.07	10 (4%) 29 27	13, 21, 42, 88	0
All	All	826/828 (99%)	-0.09	32 (3%) 39 36	8, 19, 42, 89	0

All (32) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	1	MET	13.5
1	D	1	MET	6.9
1	D	206	GLN	6.2
1	A	0	HIS	5.9
1	B	206	GLN	5.3
1	D	167	LEU	5.0
1	D	44	GLY	4.3
1	B	44	GLY	3.9
1	B	172	PRO	3.7
1	D	172	PRO	3.7
1	B	79	ASN	3.5
1	A	42	SER	3.5
1	D	78[A]	ARG	3.4
1	C	0	HIS	3.2
1	B	2	ALA	3.1
1	A	43	GLU	3.1
1	D	204[A]	GLN	3.0
1	C	43	GLU	2.8
1	B	104	ASP	2.8
1	B	204	GLN	2.7
1	B	46	ARG	2.7

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Mol	Chain	Res	Type	RSRZ
1	A	44	GLY	2.5
1	D	104	ASP	2.5
1	C	44	GLY	2.5
1	B	43	GLU	2.4
1	B	78	ARG	2.4
1	B	102	GLY	2.3
1	D	205	TYR	2.3
1	B	36	ASP	2.2
1	D	116	TRP	2.2
1	B	37	SER	2.1
1	B	205	TYR	2.1

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

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

## 6.3 Carbohydrates [i](#)

There are no monosaccharides in this entry.

## 6.4 Ligands [i](#)

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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å <sup>2</sup> )	Q<0.9
3	JBR	A	403	29/29	0.68	0.18	33,36,47,47	0
4	SO4	A	404	5/5	0.69	0.41	66,76,79,79	0
3	JBR	D	402	29/29	0.75	0.15	30,33,40,42	0
3	JBR	C	402	29/29	0.77	0.23	33,45,68,70	0
4	SO4	D	405	5/5	0.79	0.24	77,78,79,80	0
4	SO4	B	402	5/5	0.83	0.17	50,50,51,55	0
4	SO4	B	403	5/5	0.86	0.16	72,73,74,75	0
3	JBR	A	402	29/29	0.87	0.15	19,28,57,59	0
4	SO4	D	404	5/5	0.88	0.16	74,75,76,76	0
4	SO4	C	403	5/5	0.90	0.31	87,87,88,88	0
4	SO4	D	403	5/5	0.91	0.17	39,39,41,47	0
2	NAP	B	401	48/48	0.94	0.10	18,22,29,33	0

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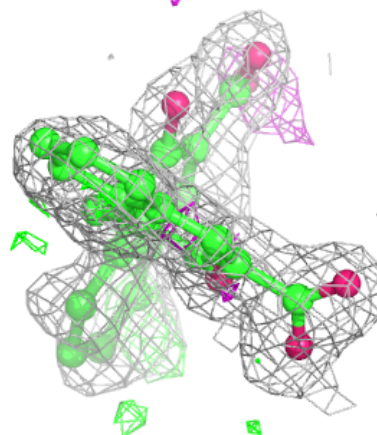
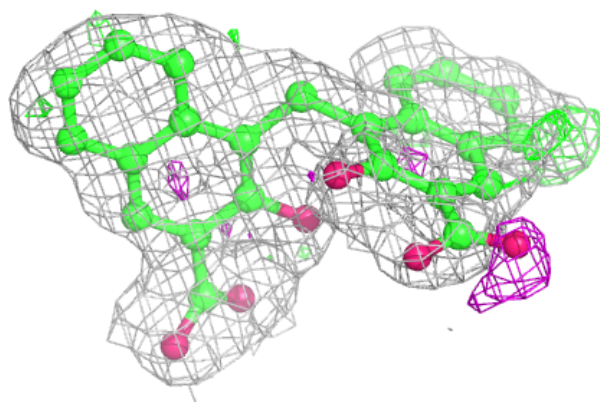
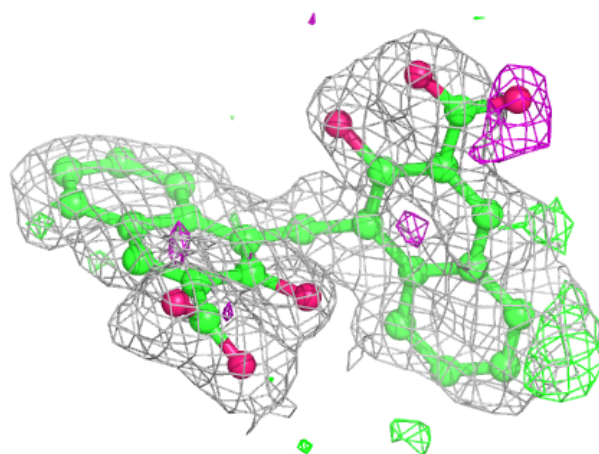
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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
2	NAP	D	401	48/48	0.95	0.10	16,21,24,27	0
2	NAP	A	401	48/48	0.98	0.07	7,10,15,19	0
2	NAP	C	401	48/48	0.99	0.07	7,9,14,21	0

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

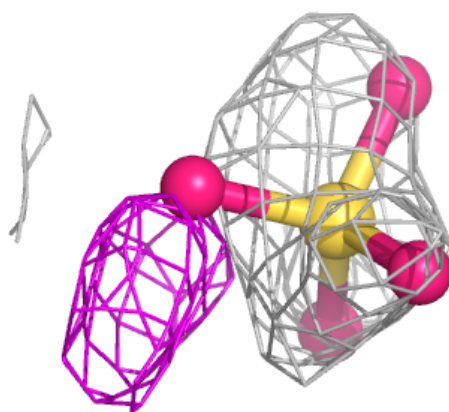
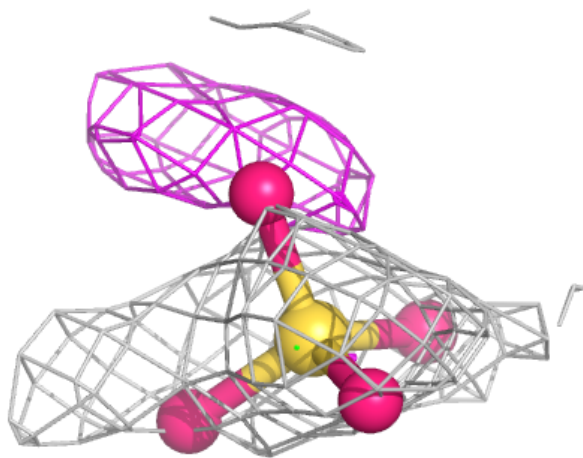
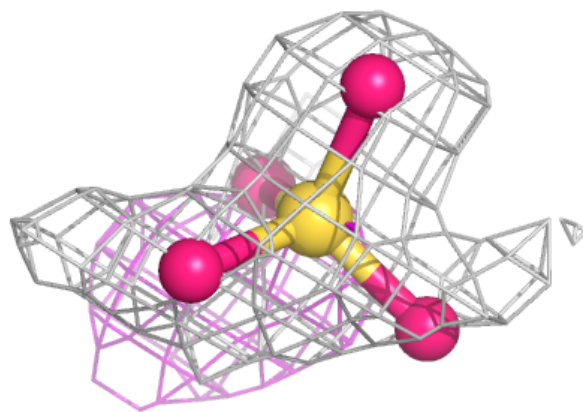
**Electron density around JBR A 403:**

2mF<sub>o</sub>-DF<sub>c</sub> (at 0.7 rmsd) in gray  
mF<sub>o</sub>-DF<sub>c</sub> (at 3 rmsd) in purple (negative)  
and green (positive)



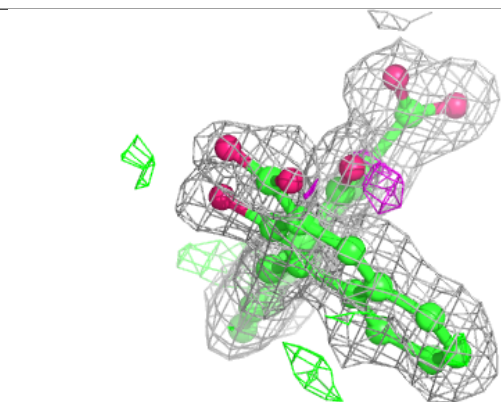
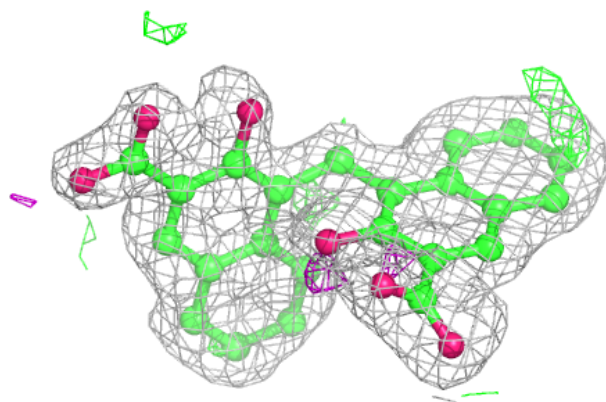
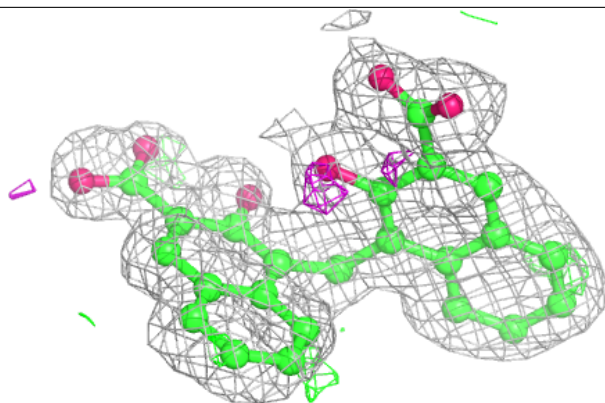
**Electron density around SO4 A 404:**

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

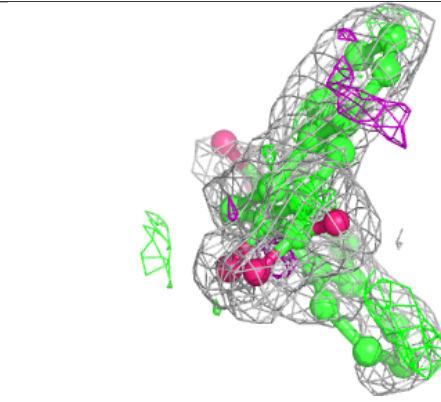
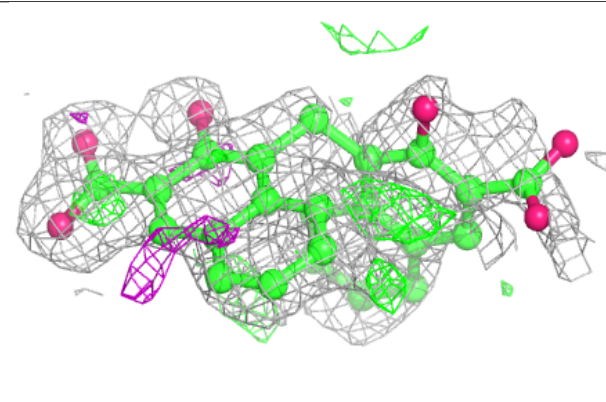
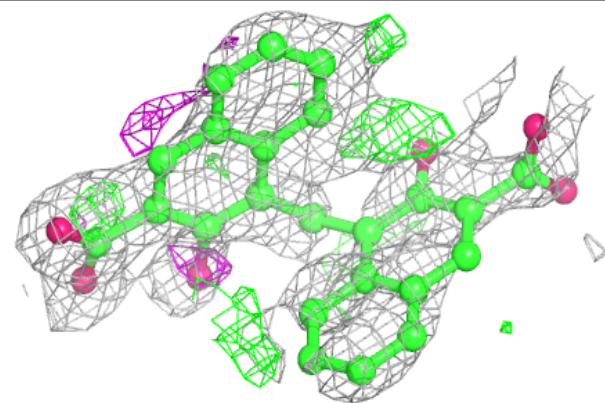


**Electron density around JBR D 402:**

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

**Electron density around JBR C 402:**

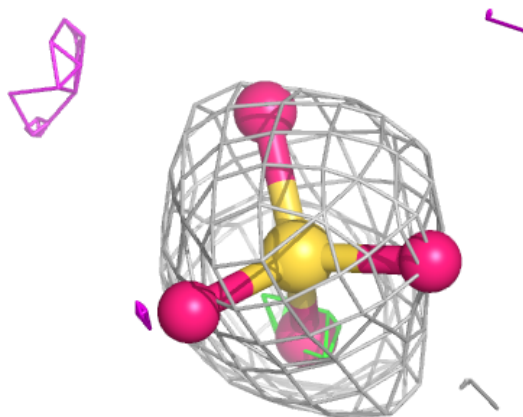
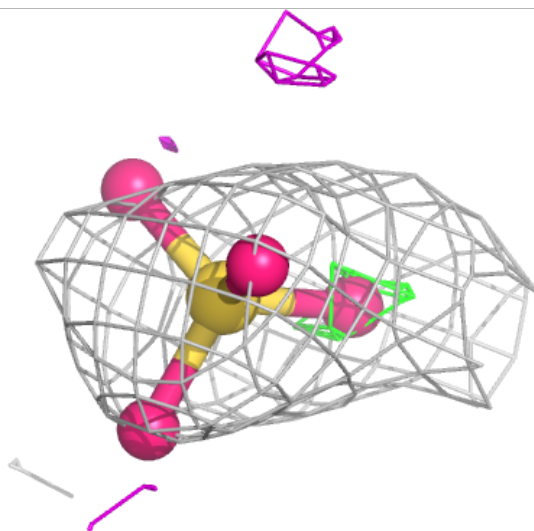
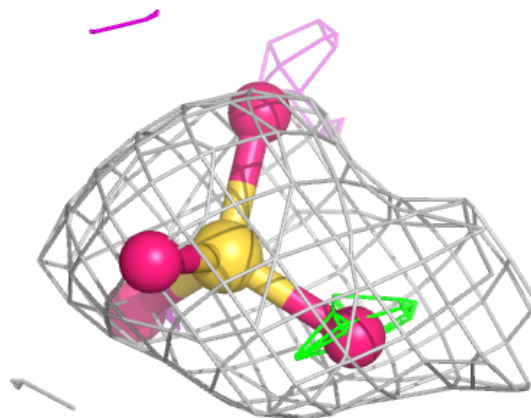
$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)





**Electron density around SO4 D 405:**

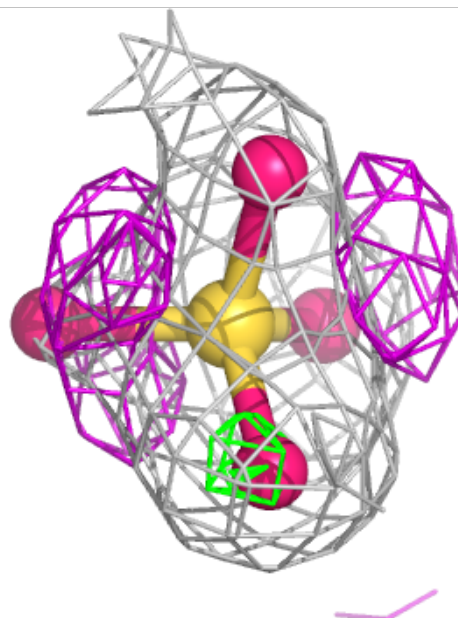
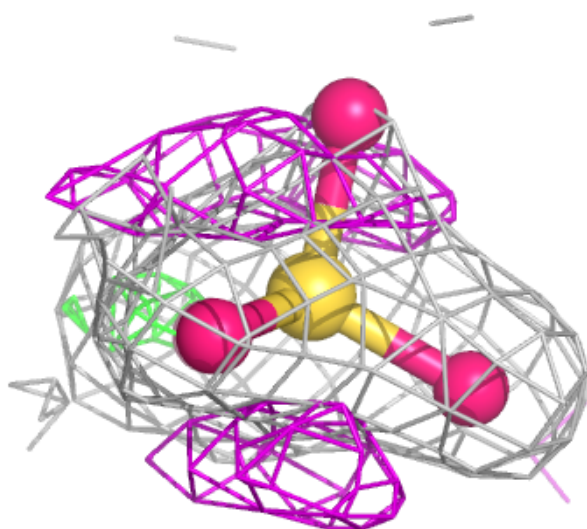
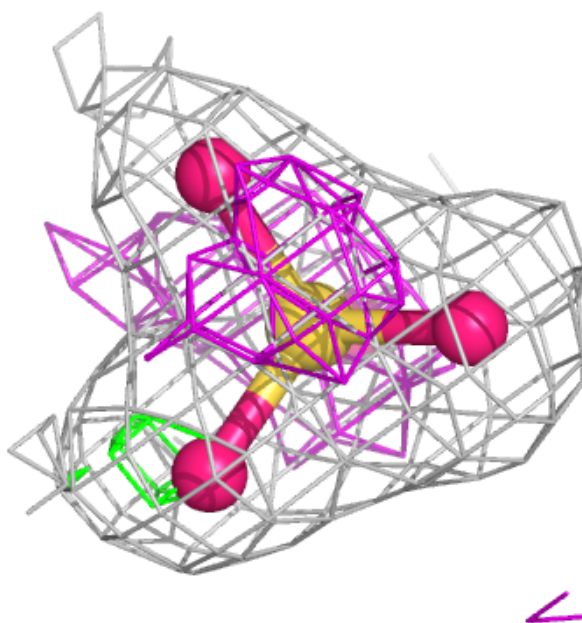
$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)





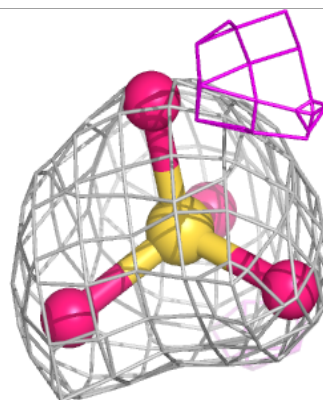
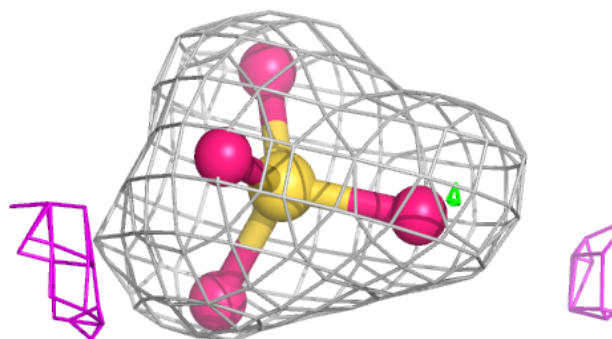
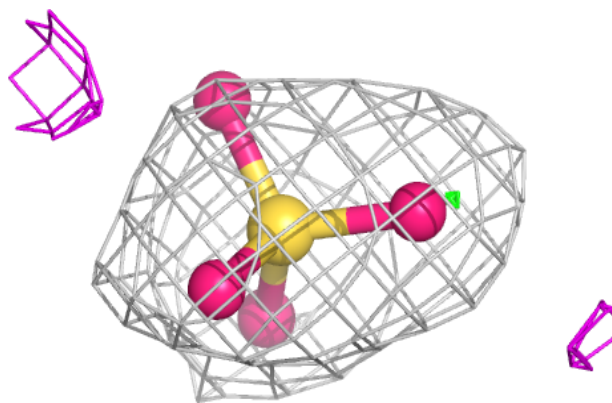
**Electron density around SO4 B 402:**

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

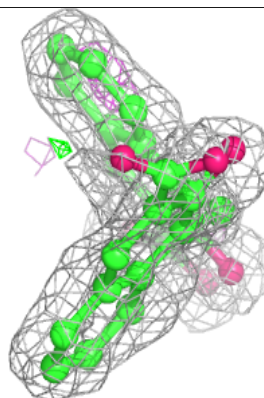
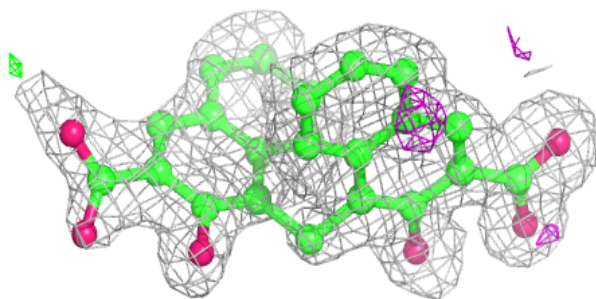
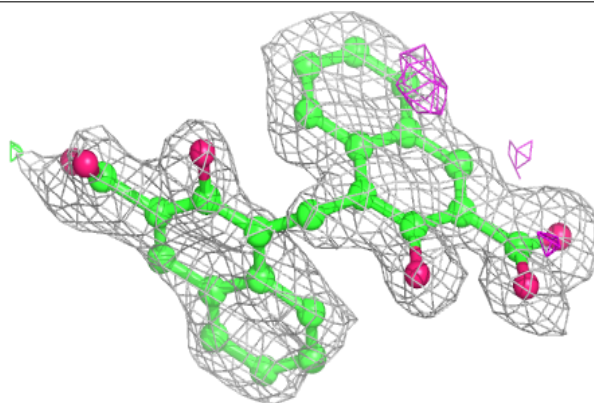


**Electron density around SO4 B 403:**

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

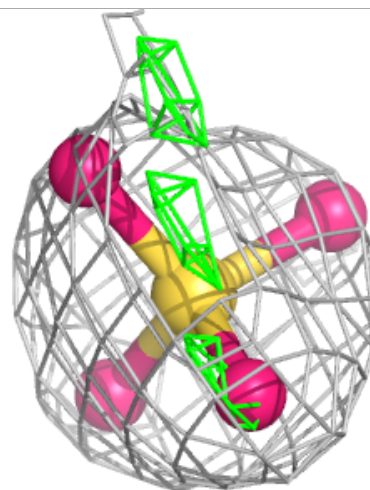
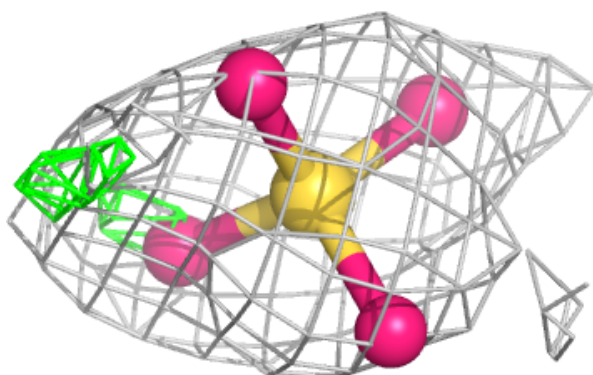
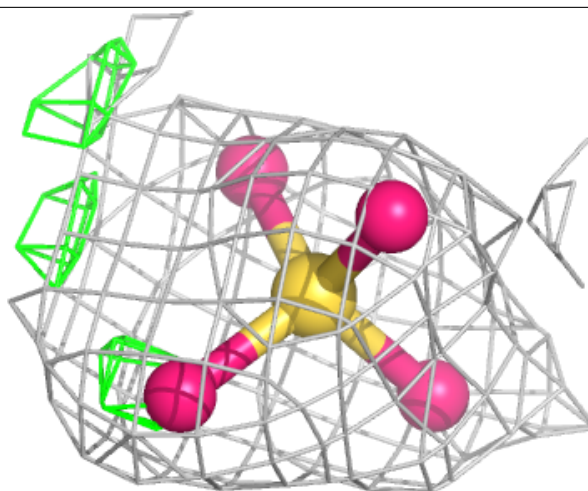
**Electron density around JBR A 402:**

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



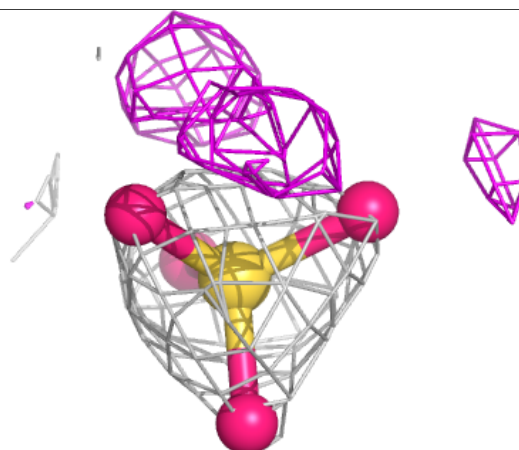
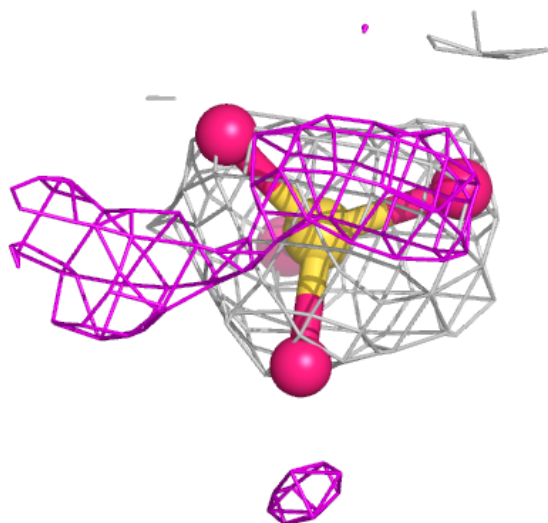
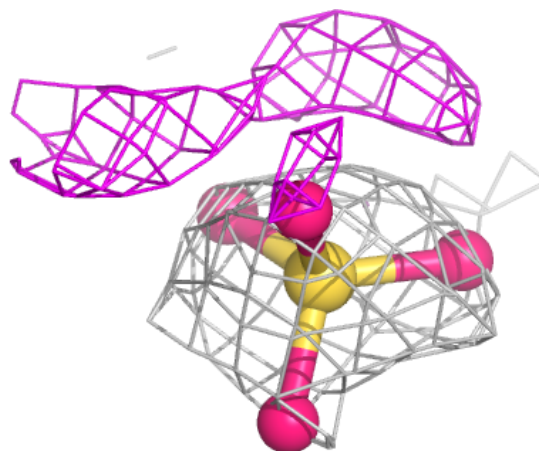
**Electron density around SO4 D 404:**

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



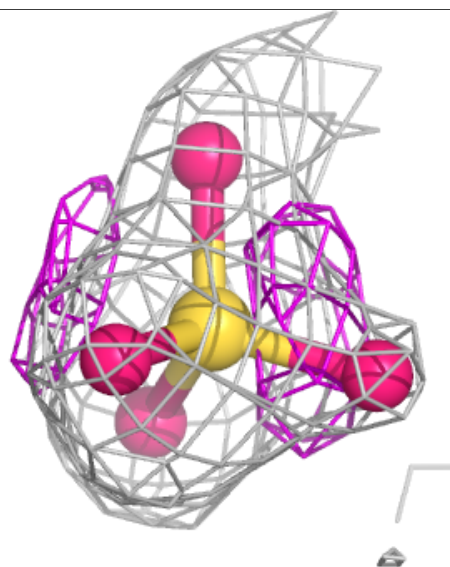
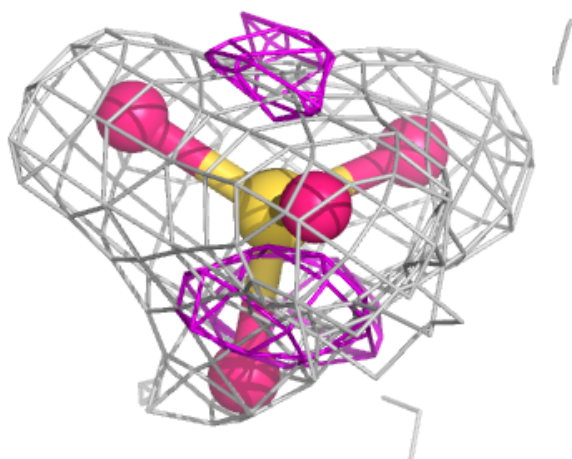
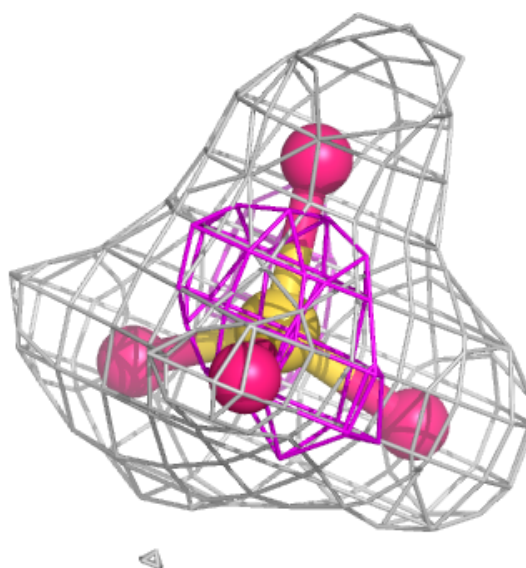
**Electron density around SO4 C 403:**

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



**Electron density around SO4 D 403:**

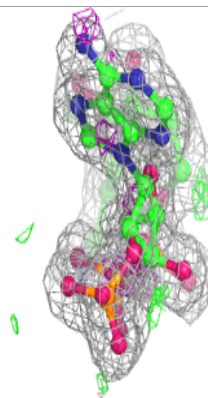
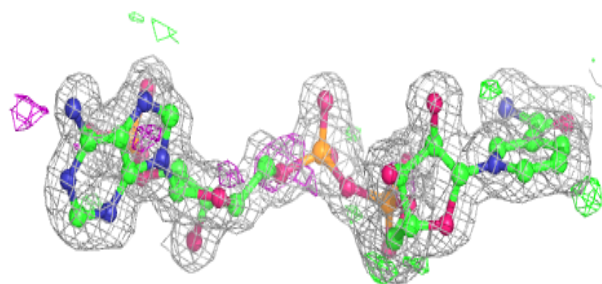
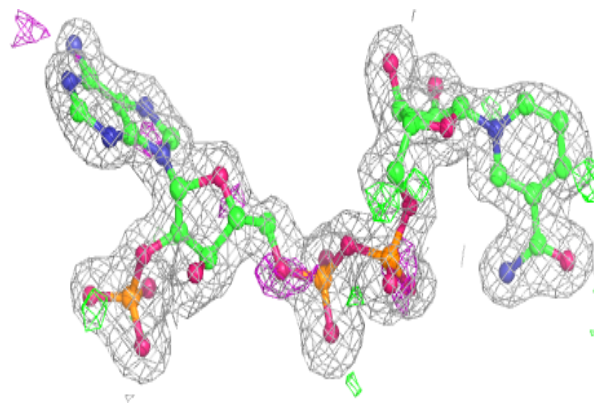
$2mF_o - DF_c$  (at 0.7 rmsd) in gray  
 $mF_o - DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)



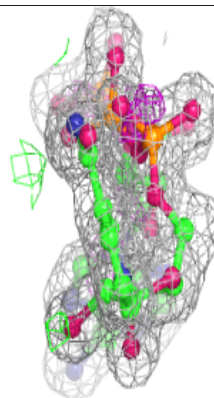
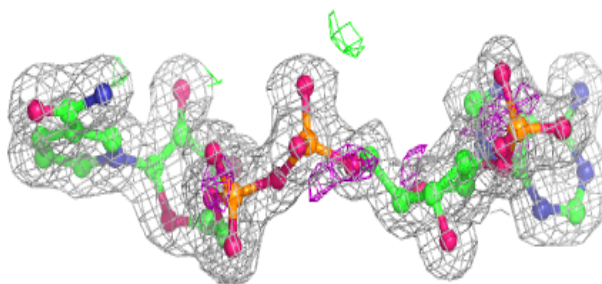
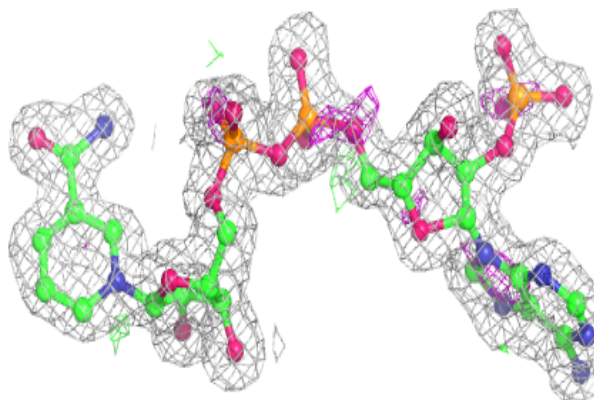


**Electron density around NAP B 401:**

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

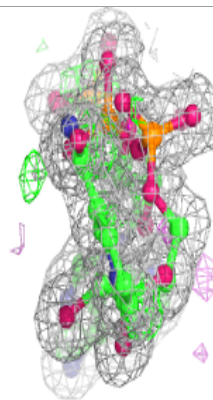
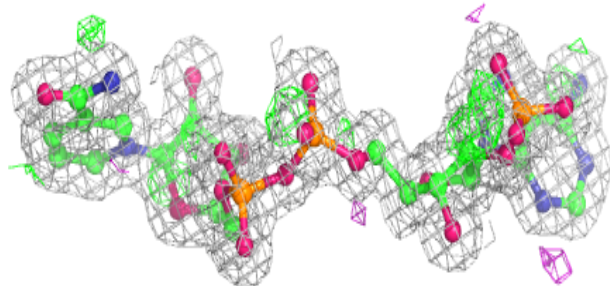
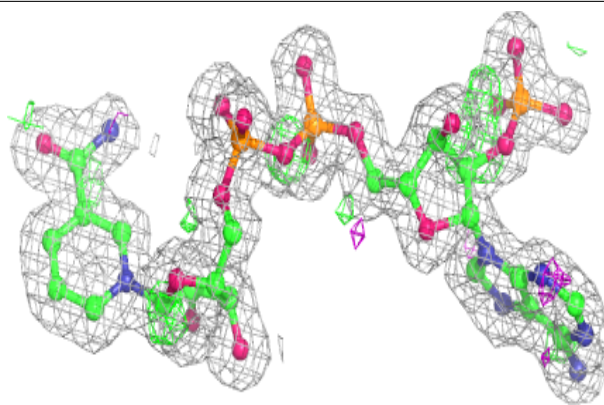
**Electron density around NAP D 401:**

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

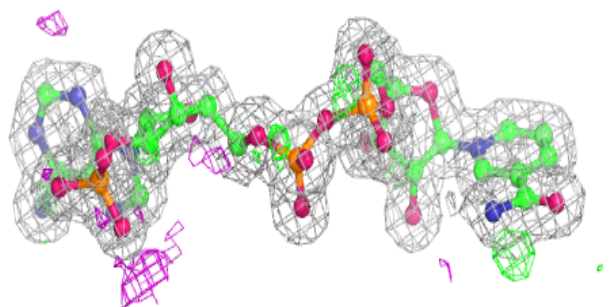
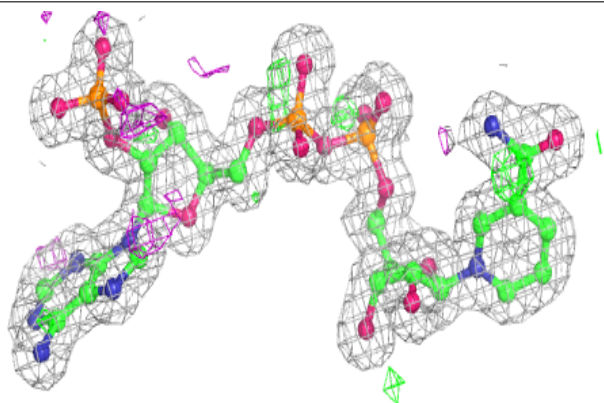


**Electron density around NAP A 401:**

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

**Electron density around NAP C 401:**

$2mF_o-DF_c$  (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.