



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 10, 2026 – 08:21 PM UTC

PDB ID : 8CZJ / pdb_00008czj
Title : A bacteria Zrt/Irt-like protein in the apo state
Authors : Zhang, Y.; Hu, J.
Deposited on : 2022-05-24
Resolution : 2.75 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

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

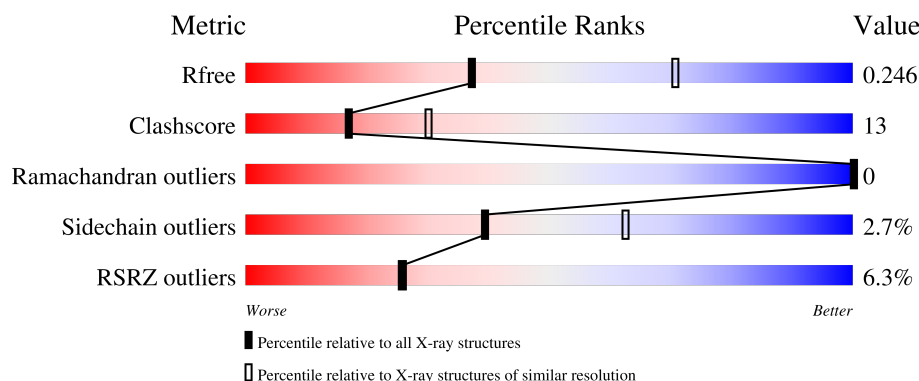
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.75 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	1009 (2.76-2.76)
Clashscore	190562	1044 (2.76-2.76)
Ramachandran outliers	187476	1024 (2.76-2.76)
Sidechain outliers	187428	1024 (2.76-2.76)
RSRZ outliers	180081	1009 (2.76-2.76)

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	309	6% 72% 24% 5%
1	B	309	6% 72% 24% .

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 criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
2	SO4	A	403	-	-	X	-
2	SO4	B	403	-	-	X	-

2 Entry composition [i](#)

There are 4 unique types of molecules in this entry. The entry contains 4289 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 Putative membrane protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	295	Total	C	N	O	S	0	0	0
			2005	1304	331	358	12			
1	B	296	Total	C	N	O	S	0	0	0
			2014	1309	332	361	12			

- Molecule 2 is SULFATE ION (CCD ID: SO4) (formula: O₄S) (labeled as "Ligand of Interest" by depositor).



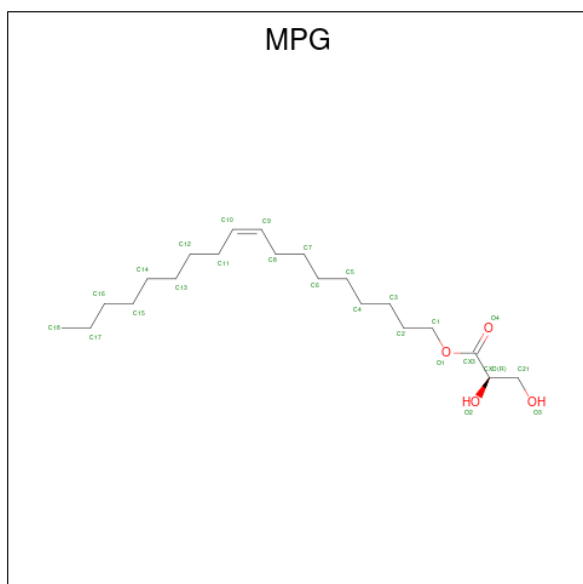
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	A	1	Total	O	S	0	0
			5	4	1		
2	A	1	Total	O	S	0	0
			5	4	1		
2	A	1	Total	O	S	0	0
			5	4	1		
2	A	1	Total	O	S	0	0
			5	4	1		

Continued on next page...

Continued from previous page...

Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	B	1	Total	O	S	0	0
			5	4	1		
2	B	1	Total	O	S	0	0
			5	4	1		
2	B	1	Total	O	S	0	0
			5	4	1		
2	B	1	Total	O	S	0	0
			5	4	1		

- Molecule 3 is [(Z)-octadec-9-enyl] (2R)-2,3-bis(oxidanyl)propanoate (CCD ID: MPG) (formula: C₂₁H₄₀O₄) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	C	O	0	0
			25	21	4		
3	A	1	Total	C	O	0	0
			25	21	4		
3	A	1	Total	C	O	0	0
			25	21	4		
3	B	1	Total	C	O	0	0
			25	21	4		
3	B	1	Total	C	O	0	0
			25	21	4		
3	B	1	Total	C	O	0	0
			25	21	4		
3	B	1	Total	C	O	0	0
			25	21	4		

Continued on next page...

Continued from previous page...

Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	B	1	Total	C	O	0	0
			25	21	4		
3	B	1	Total	C	O	0	0
			23	19	4		

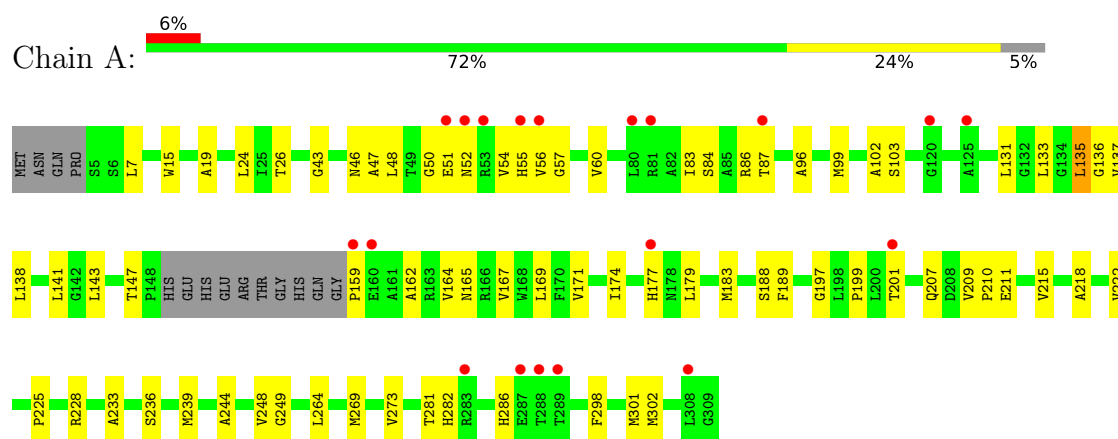
- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	3	Total	O	0	0
			3	3		
4	B	4	Total	O	0	0
			4	4		

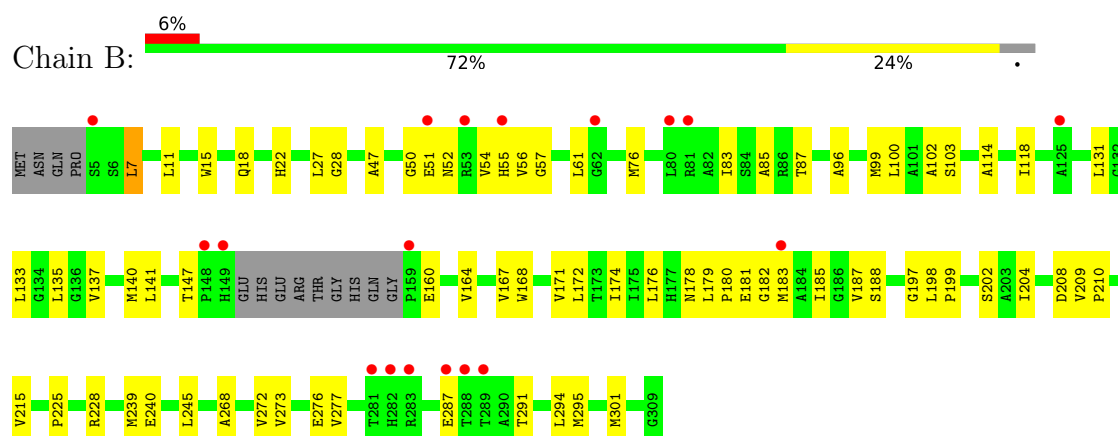
3 Residue-property plots [i](#)

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: Putative membrane protein



• Molecule 1: Putative membrane protein



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	62.98Å 117.66Å 64.29Å 90.00° 104.16° 90.00°	Depositor
Resolution (Å)	37.11 – 2.75 37.11 – 2.75	Depositor EDS
% Data completeness (in resolution range)	94.0 (37.11-2.75) 85.8 (37.11-2.75)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	0.57 (at 2.77Å)	Xtriage
Refinement program	PHENIX 1.10.1_2155	Depositor
R, R_{free}	0.233 , 0.261 (Not available) , 0.246	Depositor DCC
R_{free} test set	2005 reflections (8.99%)	wwPDB-VP
Wilson B-factor (Å ²)	51.1	Xtriage
Anisotropy	0.341	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.29 , 40.8	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	0.017 for l,-k,h	Xtriage
F_o, F_c correlation	0.90	EDS
Total number of atoms	4289	wwPDB-VP
Average B, all atoms (Å ²)	55.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 12.34% 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

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: MPG, SO4

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	0.42	0/2040	0.60	0/2789
1	B	0.44	0/2049	0.63	0/2801
All	All	0.43	0/4089	0.62	0/5590

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts

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	2005	0	2054	57	0
1	B	2014	0	2060	51	0
2	A	20	0	0	3	0
2	B	20	0	0	4	0
3	A	75	0	119	6	0
3	B	148	0	233	11	0
4	A	3	0	0	0	0
4	B	4	0	0	1	0
All	All	4289	0	4466	111	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 13.

All (111) 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:179:LEU:HD13	1:A:239:MET:HE3	1.53	0.87
1:A:298:PHE:CE1	1:A:302:MET:HE2	2.14	0.83
1:A:171:VAL:O	1:A:174:ILE:HG22	1.78	0.82
1:B:171:VAL:O	1:B:174:ILE:HG22	1.79	0.81
1:A:99:MET:SD	1:A:207:GLN:NE2	2.54	0.81
1:B:179:LEU:HD13	1:B:239:MET:HE3	1.66	0.76
1:A:199:PRO:HB3	1:A:301:MET:HE1	1.69	0.75
1:A:298:PHE:HE1	1:A:302:MET:HE2	1.53	0.70
1:B:273:VAL:HA	1:B:277:VAL:HG22	1.74	0.70
1:B:47:ALA:HB2	1:B:52:ASN:HD22	1.60	0.67
3:B:405:MPG:O4	3:B:405:MPG:O3	2.11	0.66
1:A:286:HIS:NE2	2:A:403:SO4:O1	2.24	0.65
1:A:102:ALA:HB2	1:A:301:MET:HE2	1.78	0.65
1:B:57:GLY:N	2:B:403:SO4:O3	2.25	0.64
1:A:55:HIS:HA	2:B:403:SO4:O1	1.97	0.63
1:A:244:ALA:O	1:A:248:VAL:HG23	1.98	0.63
1:B:198:LEU:O	1:B:202:SER:OG	2.18	0.61
1:A:15:TRP:HB3	3:A:404:MPG:HX31	1.83	0.61
1:A:228:ARG:CZ	1:B:7:LEU:HD12	2.31	0.61
1:B:102:ALA:HB2	1:B:301:MET:HE2	1.83	0.60
1:A:199:PRO:CB	1:A:301:MET:HE1	2.30	0.60
1:A:7:LEU:HD11	1:A:169:LEU:HD21	1.84	0.60
1:A:228:ARG:NH2	1:B:7:LEU:HD12	2.17	0.59
1:A:143:LEU:HD13	3:A:404:MPG:H151	1.85	0.59
3:B:407:MPG:O4	3:B:407:MPG:O3	2.21	0.59
1:B:208:ASP:OD1	4:B:501:HOH:O	2.16	0.58
1:A:298:PHE:CD1	1:A:302:MET:HE2	2.38	0.58
1:B:114:ALA:O	1:B:118:ILE:HD12	2.03	0.57
1:B:164:VAL:O	1:B:167:VAL:HG22	2.05	0.57
1:A:197:GLY:O	1:A:201:THR:HG23	2.05	0.57
1:B:225:PRO:HD2	1:B:228:ARG:HD2	1.86	0.57
1:B:85:ALA:HB3	2:B:404:SO4:O3	2.05	0.56
1:A:209:VAL:HB	1:A:210:PRO:HD3	1.88	0.56
1:B:27:LEU:HD13	3:B:410:MPG:H32C	1.88	0.56
1:A:225:PRO:HD2	1:A:228:ARG:HD2	1.88	0.55
1:B:209:VAL:HB	1:B:210:PRO:HD3	1.88	0.55
1:B:28:GLY:HA2	3:B:409:MPG:H9	1.88	0.54
1:A:177:HIS:HA	3:A:404:MPG:H162	1.90	0.54
1:A:188:SER:HB2	1:A:197:GLY:HA2	1.89	0.53
1:B:11:LEU:HD22	1:B:15:TRP:CZ2	2.44	0.53

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:179:LEU:O	1:B:183:MET:HG3	2.09	0.53
1:A:136:GLY:HA2	1:A:264:LEU:HD12	1.90	0.52
1:B:27:LEU:HD21	3:B:409:MPG:H41C	1.92	0.51
1:A:56:VAL:HG12	1:A:60:VAL:HG23	1.93	0.51
1:A:57:GLY:HA3	3:B:405:MPG:HxD	1.91	0.51
1:A:233:ALA:O	1:A:236:SER:OG	2.27	0.51
1:A:143:LEU:O	1:A:147:THR:HG23	2.10	0.51
1:A:86:ARG:N	2:A:403:SO4:O2	2.44	0.51
1:B:100:LEU:HD12	1:B:294:LEU:HD11	1.92	0.51
1:B:131:LEU:O	1:B:135:LEU:HB2	2.12	0.50
1:B:178:ASN:HA	1:B:181:GLU:OE1	2.11	0.50
1:A:164:VAL:O	1:A:167:VAL:HG22	2.11	0.50
1:A:159:PRO:HA	1:A:162:ALA:HB3	1.94	0.50
1:B:18:GLN:HE21	1:B:22:HIS:CD2	2.29	0.50
1:A:269:MET:O	1:A:273:VAL:HG23	2.12	0.50
3:A:407:MPG:H22C	1:B:61:LEU:HD11	1.95	0.49
1:B:160:GLU:O	1:B:164:VAL:HG13	2.12	0.49
1:A:83:ILE:HG23	1:A:87:THR:OG1	2.12	0.49
1:A:48:LEU:O	3:B:407:MPG:HxD	2.13	0.48
1:B:133:LEU:O	1:B:137:VAL:HG23	2.14	0.48
1:A:135:LEU:HA	1:A:135:LEU:HD12	1.68	0.48
1:B:188:SER:HB2	1:B:197:GLY:HA2	1.96	0.47
1:B:28:GLY:CA	3:B:409:MPG:H9	2.43	0.47
1:A:189:PHE:HE2	1:A:201:THR:HG21	1.79	0.47
1:B:140:MET:HE1	1:B:180:PRO:HG3	1.97	0.47
1:B:272:VAL:O	1:B:276:GLU:HB2	2.14	0.47
1:A:84:SER:OG	2:A:403:SO4:O2	2.32	0.47
1:B:287:GLU:O	1:B:291:THR:HG23	2.15	0.46
1:B:83:ILE:HG23	1:B:87:THR:OG1	2.15	0.46
1:A:218:ALA:O	1:A:222:VAL:HG23	2.15	0.45
3:B:410:MPG:H151	3:B:410:MPG:H122	1.54	0.45
1:B:99:MET:HE1	1:B:204:ILE:HG12	1.98	0.45
1:B:54:VAL:HG12	1:B:55:HIS:H	1.81	0.45
1:A:15:TRP:CE2	3:A:404:MPG:H51C	2.52	0.45
1:A:7:LEU:HD13	1:A:165:ASN:HB3	1.99	0.44
1:A:50:GLY:O	1:A:51:GLU:HB2	2.18	0.44
1:A:136:GLY:CA	1:A:264:LEU:HD12	2.46	0.44
1:B:50:GLY:O	1:B:51:GLU:HB2	2.17	0.44
1:B:183:MET:O	1:B:187:VAL:HG23	2.17	0.44
1:B:11:LEU:HD22	1:B:15:TRP:CE2	2.52	0.44
1:A:46:ASN:O	1:A:50:GLY:O	2.36	0.44

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:A:404:MPG:H211	3:A:405:MPG:H42C	2.00	0.44
1:B:76:MET:HE2	1:B:83:ILE:HD11	2.00	0.43
1:B:185:ILE:HG13	1:B:204:ILE:HD12	2.00	0.43
1:B:176:LEU:HD23	1:B:239:MET:HE2	1.99	0.43
1:B:295:MET:HE2	1:B:295:MET:HB3	1.81	0.43
1:A:133:LEU:O	1:A:137:VAL:HG23	2.19	0.43
1:A:96:ALA:HB1	1:A:273:VAL:HG13	2.01	0.43
1:B:96:ALA:HB1	1:B:273:VAL:HG13	2.01	0.43
1:B:168:TRP:O	1:B:172:LEU:HD22	2.19	0.42
1:A:47:ALA:HB2	1:A:52:ASN:HD22	1.84	0.42
1:A:211:GLU:O	1:A:215:VAL:HG23	2.20	0.42
1:B:199:PRO:C	1:B:301:MET:HE1	2.45	0.42
1:A:43:GLY:HA3	1:A:249:GLY:O	2.19	0.42
1:B:56:VAL:N	2:B:403:SO4:O3	2.53	0.42
3:B:407:MPG:H52C	3:B:407:MPG:H21C	1.66	0.41
1:A:281:THR:OG1	1:A:282:HIS:HD2	2.03	0.41
1:A:167:VAL:HG12	1:A:222:VAL:CG1	2.51	0.41
1:A:183:MET:HE2	1:A:183:MET:HB3	1.85	0.41
1:B:27:LEU:HD23	3:B:409:MPG:H72C	2.02	0.41
1:B:135:LEU:HD12	1:B:135:LEU:HA	1.79	0.41
1:A:225:PRO:HG2	1:A:228:ARG:NE	2.35	0.41
1:B:182:GLY:HA3	1:B:240:GLU:HA	2.02	0.41
1:A:189:PHE:CE2	1:A:201:THR:HG21	2.55	0.41
1:A:99:MET:HE2	1:A:99:MET:HB3	1.72	0.41
1:A:164:VAL:HG23	1:A:165:ASN:OD1	2.21	0.41
1:A:19:ALA:HA	1:A:26:THR:OG1	2.22	0.40
1:B:268:ALA:O	1:B:272:VAL:HG23	2.22	0.40
1:A:54:VAL:C	1:A:55:HIS:HD2	2.29	0.40
1:B:174:ILE:CG1	1:B:215:VAL:HG13	2.51	0.40
1:A:131:LEU:O	1:A:135:LEU:HB2	2.21	0.40

There are no symmetry-related clashes.

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	291/309 (94%)	284 (98%)	7 (2%)	0	100	100
1	B	292/309 (94%)	283 (97%)	9 (3%)	0	100	100
All	All	583/618 (94%)	567 (97%)	16 (3%)	0	100	100

There are no Ramachandran outliers to report.

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	186/211 (88%)	181 (97%)	5 (3%)	39	62
1	B	187/211 (89%)	182 (97%)	5 (3%)	39	62
All	All	373/422 (88%)	363 (97%)	10 (3%)	39	62

All (10) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	24	LEU
1	A	103	SER
1	A	135	LEU
1	A	138	LEU
1	A	141	LEU
1	B	7	LEU
1	B	103	SER
1	B	141	LEU
1	B	147	THR
1	B	245	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (6) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	55	HIS
1	A	207	GLN
1	A	282	HIS
1	B	22	HIS
1	B	55	HIS
1	B	275	HIS

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 oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

17 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	MPG	A	404	-	24,24,24	0.97	1 (4%)	24,25,25	1.37	2 (8%)
2	SO4	A	402	-	4,4,4	0.23	0	6,6,6	0.18	0
3	MPG	A	405	-	24,24,24	1.06	1 (4%)	24,25,25	1.32	3 (12%)
3	MPG	B	407	-	24,24,24	0.94	1 (4%)	24,25,25	1.02	1 (4%)
2	SO4	B	401	-	4,4,4	0.30	0	6,6,6	0.27	0
3	MPG	A	407	-	24,24,24	0.91	2 (8%)	24,25,25	1.50	3 (12%)
3	MPG	B	405	-	24,24,24	0.90	2 (8%)	24,25,25	1.37	2 (8%)
2	SO4	A	403	-	4,4,4	0.18	0	6,6,6	0.20	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
3	MPG	B	408	-	24,24,24	0.99	1 (4%)	24,25,25	1.51	2 (8%)
3	MPG	B	410	-	22,22,24	1.03	1 (4%)	22,23,25	1.26	3 (13%)
2	SO4	B	404	-	4,4,4	0.26	0	6,6,6	0.30	0
3	MPG	B	409	-	24,24,24	0.83	1 (4%)	24,25,25	1.19	3 (12%)
2	SO4	B	402	-	4,4,4	0.21	0	6,6,6	0.37	0
3	MPG	B	406	-	24,24,24	1.02	1 (4%)	24,25,25	1.00	1 (4%)
2	SO4	A	401	-	4,4,4	0.48	0	6,6,6	0.90	0
2	SO4	A	406	-	4,4,4	0.35	0	6,6,6	0.38	0
2	SO4	B	403	-	4,4,4	0.35	0	6,6,6	0.40	0

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	MPG	A	404	-	-	9/25/25/25	-
3	MPG	A	405	-	-	14/25/25/25	-
3	MPG	B	407	-	-	12/25/25/25	-
3	MPG	A	407	-	-	12/25/25/25	-
3	MPG	B	405	-	-	18/25/25/25	-
3	MPG	B	408	-	-	17/25/25/25	-
3	MPG	B	409	-	-	7/25/25/25	-
3	MPG	B	406	-	-	14/25/25/25	-
3	MPG	B	410	-	-	13/23/23/25	-

All (11) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	405	MPG	O1-CX3	4.13	1.42	1.33
3	B	408	MPG	O1-CX3	4.00	1.41	1.33
3	B	406	MPG	O1-CX3	3.92	1.41	1.33
3	B	410	MPG	O1-CX3	3.89	1.41	1.33
3	A	404	MPG	O1-CX3	3.68	1.41	1.33
3	A	407	MPG	O1-CX3	3.59	1.40	1.33
3	B	407	MPG	O1-CX3	3.51	1.40	1.33
3	B	409	MPG	O1-CX3	3.22	1.40	1.33
3	B	405	MPG	O1-CX3	3.17	1.40	1.33
3	B	405	MPG	O1-C1	-2.09	1.39	1.45

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	407	MPG	O1-C1	-2.07	1.39	1.45

All (20) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	405	MPG	O1-CX3-CXD	4.63	122.49	111.78
3	A	404	MPG	O1-CX3-CXD	4.44	122.06	111.78
3	B	408	MPG	O1-CX3-CXD	4.43	122.02	111.78
3	A	407	MPG	O1-CX3-CXD	3.90	120.79	111.78
3	B	405	MPG	O1-CX3-CXD	3.56	120.03	111.78
3	B	410	MPG	O1-CX3-CXD	3.37	119.57	111.78
3	B	406	MPG	O1-CX3-CXD	3.31	119.43	111.78
3	A	407	MPG	O1-CX3-O4	-3.26	118.17	124.14
3	A	404	MPG	O1-CX3-O4	-3.15	118.38	124.14
3	B	409	MPG	O1-CX3-CXD	3.12	118.99	111.78
3	B	407	MPG	O1-CX3-CXD	2.96	118.63	111.78
3	B	408	MPG	O1-CX3-O4	-2.95	118.74	124.14
3	A	405	MPG	O1-CX3-O4	-2.79	119.04	124.14
3	A	407	MPG	C1-O1-CX3	-2.59	110.83	116.53
3	B	405	MPG	O1-CX3-O4	-2.55	119.47	124.14
3	B	409	MPG	O1-CX3-O4	-2.27	119.99	124.14
3	B	410	MPG	O1-C1-C2	2.18	116.14	108.61
3	B	409	MPG	O3-C21-CXD	-2.16	106.64	111.95
3	A	405	MPG	O4-CX3-CXD	-2.10	118.47	123.56
3	B	410	MPG	C3-C2-C1	-2.05	104.57	113.47

There are no chirality outliers.

All (116) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	404	MPG	O1-CX3-CXD-C21
3	A	405	MPG	CXD-CX3-O1-C1
3	A	405	MPG	O3-C21-CXD-O2
3	A	407	MPG	O3-C21-CXD-O2
3	A	407	MPG	O3-C21-CXD-CX3
3	B	405	MPG	CXD-CX3-O1-C1
3	B	405	MPG	O3-C21-CXD-O2
3	B	405	MPG	O3-C21-CXD-CX3
3	B	406	MPG	O3-C21-CXD-O2
3	B	407	MPG	O3-C21-CXD-O2
3	B	408	MPG	CXD-CX3-O1-C1
3	B	408	MPG	O4-CX3-O1-C1

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms
3	B	408	MPG	O1-CX3-CXD-O2
3	B	408	MPG	O4-CX3-CXD-O2
3	B	408	MPG	O1-CX3-CXD-C21
3	B	408	MPG	O4-CX3-CXD-C21
3	B	409	MPG	O3-C21-CXD-O2
3	B	410	MPG	O3-C21-CXD-O2
3	B	410	MPG	O3-C21-CXD-CX3
3	B	410	MPG	O4-CX3-CXD-O2
3	B	410	MPG	O4-CX3-CXD-C21
3	A	407	MPG	O4-CX3-O1-C1
3	B	405	MPG	O4-CX3-O1-C1
3	A	405	MPG	O4-CX3-O1-C1
3	A	407	MPG	CXD-CX3-O1-C1
3	B	407	MPG	O4-CX3-O1-C1
3	A	404	MPG	C14-C15-C16-C17
3	B	408	MPG	O1-C1-C2-C3
3	B	407	MPG	CXD-CX3-O1-C1
3	A	405	MPG	O1-C1-C2-C3
3	A	407	MPG	O1-C1-C2-C3
3	B	406	MPG	C10-C11-C12-C13
3	B	408	MPG	C13-C14-C15-C16
3	B	408	MPG	C1-C2-C3-C4
3	A	405	MPG	C6-C7-C8-C9
3	A	405	MPG	C1-C2-C3-C4
3	B	405	MPG	C1-C2-C3-C4
3	B	409	MPG	C5-C6-C7-C8
3	A	407	MPG	C5-C6-C7-C8
3	B	405	MPG	C11-C12-C13-C14
3	B	408	MPG	C5-C6-C7-C8
3	B	405	MPG	O1-C1-C2-C3
3	B	405	MPG	C12-C13-C14-C15
3	B	407	MPG	C10-C11-C12-C13
3	B	408	MPG	C10-C11-C12-C13
3	A	407	MPG	C4-C5-C6-C7
3	A	405	MPG	C11-C12-C13-C14
3	B	407	MPG	C13-C14-C15-C16
3	B	410	MPG	C3-C4-C5-C6
3	A	404	MPG	C1-C2-C3-C4
3	B	409	MPG	C10-C11-C12-C13
3	B	409	MPG	C12-C13-C14-C15
3	B	405	MPG	C2-C3-C4-C5
3	A	407	MPG	C14-C15-C16-C17

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms
3	A	404	MPG	O1-C1-C2-C3
3	A	405	MPG	C10-C11-C12-C13
3	B	408	MPG	C6-C7-C8-C9
3	A	404	MPG	C5-C6-C7-C8
3	B	405	MPG	O4-CX3-CXD-O2
3	B	409	MPG	C14-C15-C16-C17
3	B	407	MPG	C3-C4-C5-C6
3	A	407	MPG	C10-C11-C12-C13
3	B	406	MPG	C11-C12-C13-C14
3	B	405	MPG	C14-C15-C16-C17
3	A	407	MPG	C6-C7-C8-C9
3	A	405	MPG	O3-C21-CXD-CX3
3	B	406	MPG	O3-C21-CXD-CX3
3	B	408	MPG	C11-C12-C13-C14
3	A	407	MPG	C1-C2-C3-C4
3	A	405	MPG	C3-C4-C5-C6
3	A	404	MPG	C11-C12-C13-C14
3	B	410	MPG	C2-C3-C4-C5
3	A	404	MPG	C10-C11-C12-C13
3	B	410	MPG	O1-CX3-CXD-O2
3	B	406	MPG	C1-C2-C3-C4
3	B	408	MPG	C12-C13-C14-C15
3	B	406	MPG	O1-C1-C2-C3
3	B	407	MPG	O3-C21-CXD-CX3
3	B	405	MPG	C5-C6-C7-C8
3	B	406	MPG	C4-C5-C6-C7
3	B	410	MPG	C11-C12-C13-C14
3	B	406	MPG	C15-C16-C17-C18
3	A	404	MPG	O4-CX3-CXD-C21
3	B	410	MPG	O1-CX3-CXD-C21
3	B	407	MPG	C2-C3-C4-C5
3	B	405	MPG	C9-C10-C11-C12
3	B	408	MPG	C14-C15-C16-C17
3	B	409	MPG	C6-C7-C8-C9
3	B	405	MPG	C7-C8-C9-C10
3	B	410	MPG	C2-C1-O1-CX3
3	B	407	MPG	O1-CX3-CXD-O2
3	B	409	MPG	C2-C3-C4-C5
3	B	407	MPG	C12-C13-C14-C15
3	B	405	MPG	C13-C14-C15-C16
3	A	405	MPG	C15-C16-C17-C18
3	B	408	MPG	C4-C5-C6-C7

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms
3	A	405	MPG	C9-C10-C11-C12
3	B	410	MPG	C12-C13-C14-C15
3	B	405	MPG	C15-C16-C17-C18
3	B	406	MPG	O4-CX3-CXD-O2
3	B	407	MPG	C7-C8-C9-C10
3	B	410	MPG	C7-C8-C9-C10
3	B	410	MPG	C9-C10-C11-C12
3	B	406	MPG	C7-C8-C9-C10
3	B	405	MPG	C3-C4-C5-C6
3	A	405	MPG	C2-C3-C4-C5
3	A	407	MPG	C7-C8-C9-C10
3	B	407	MPG	C9-C10-C11-C12
3	B	408	MPG	C9-C10-C11-C12
3	B	406	MPG	C14-C15-C16-C17
3	A	404	MPG	C9-C10-C11-C12
3	B	406	MPG	C12-C13-C14-C15
3	A	405	MPG	O1-CX3-CXD-O2
3	B	405	MPG	O1-CX3-CXD-O2
3	B	406	MPG	O1-CX3-CXD-O2
3	B	406	MPG	C9-C10-C11-C12

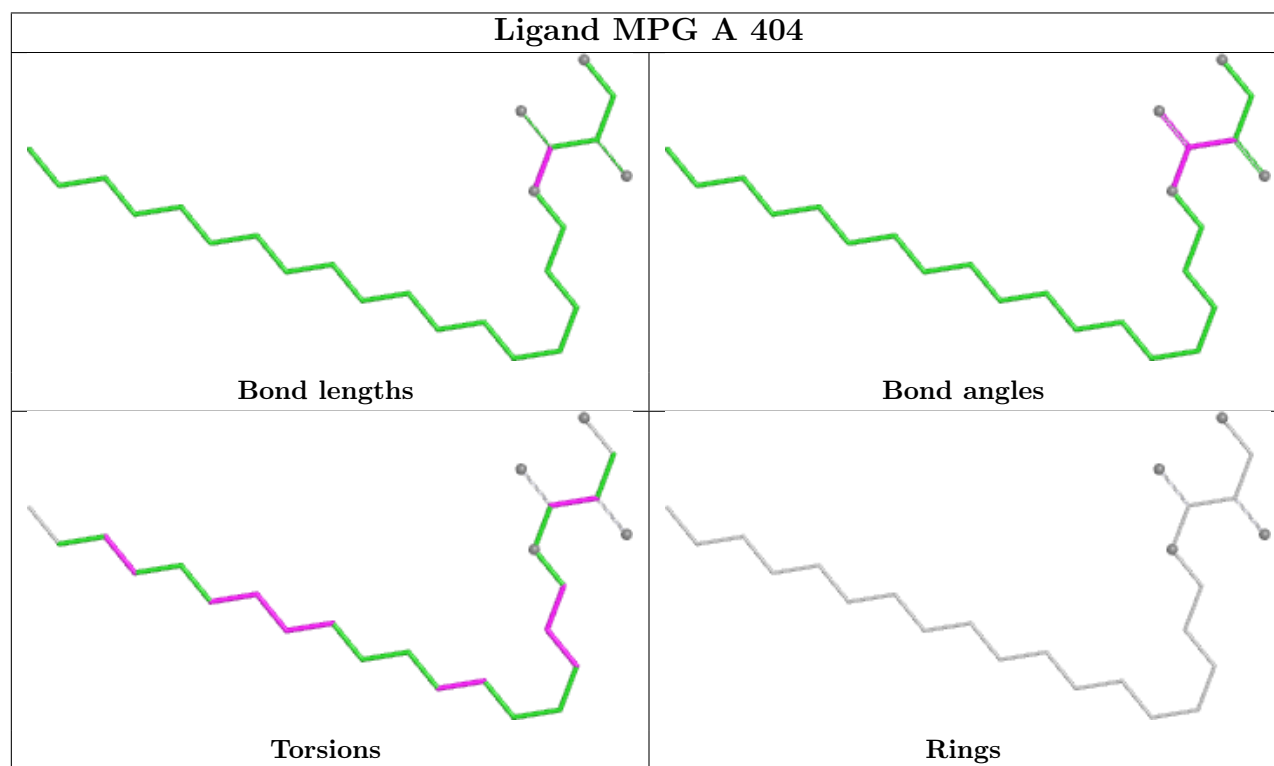
There are no ring outliers.

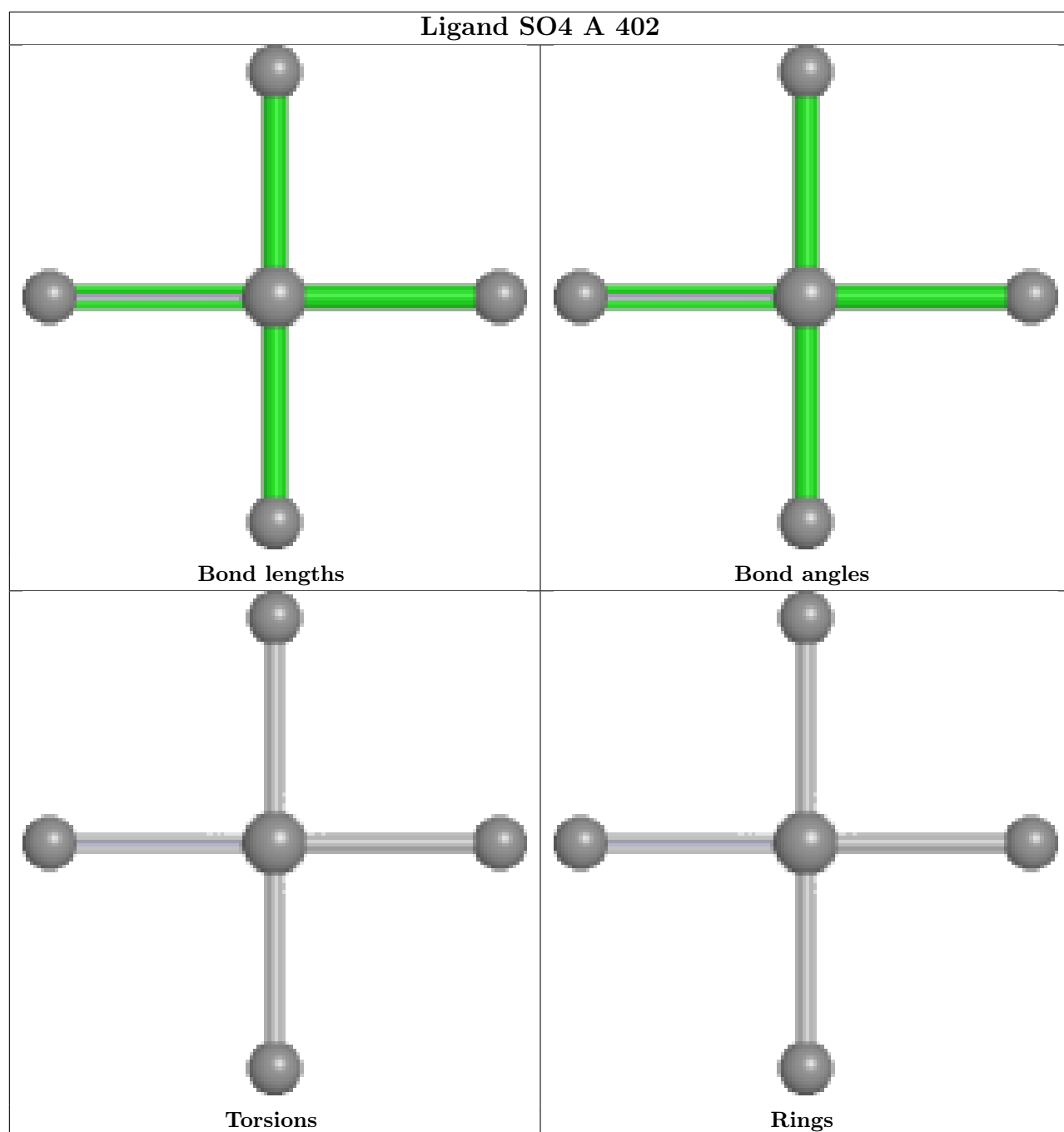
10 monomers are involved in 24 short contacts:

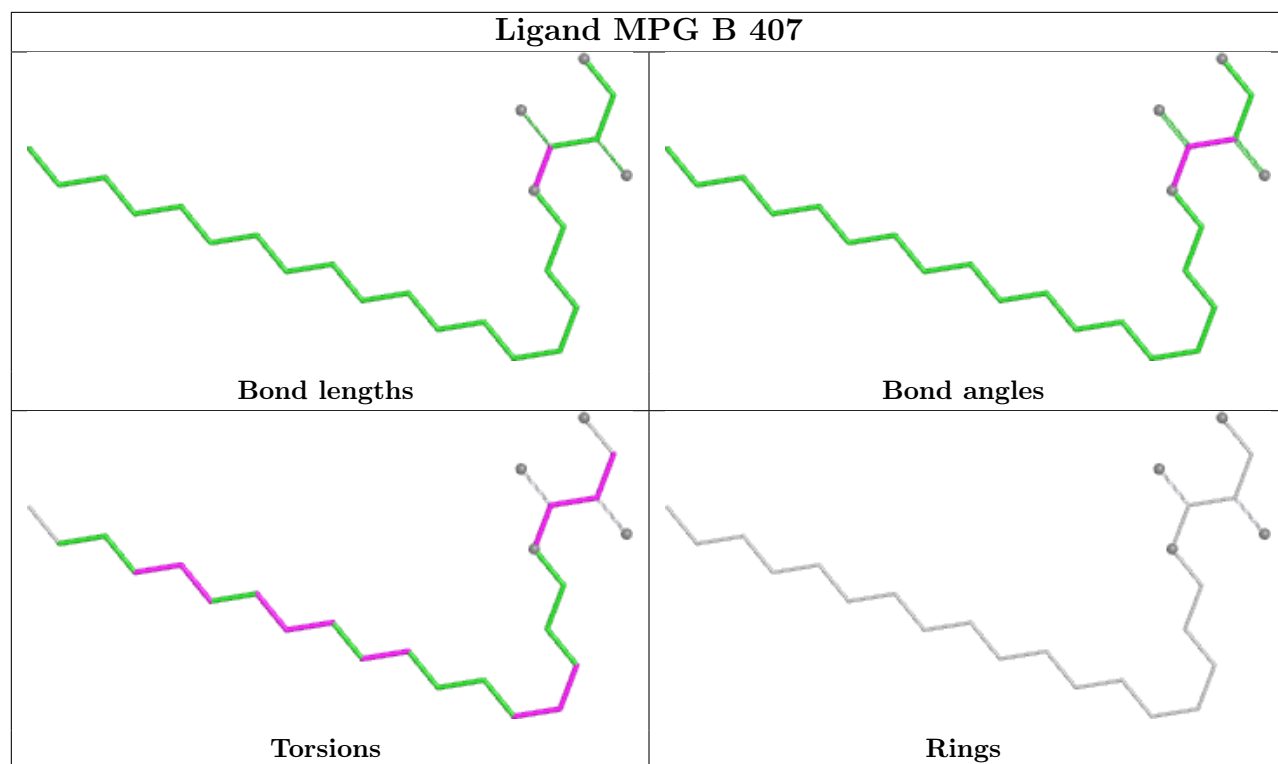
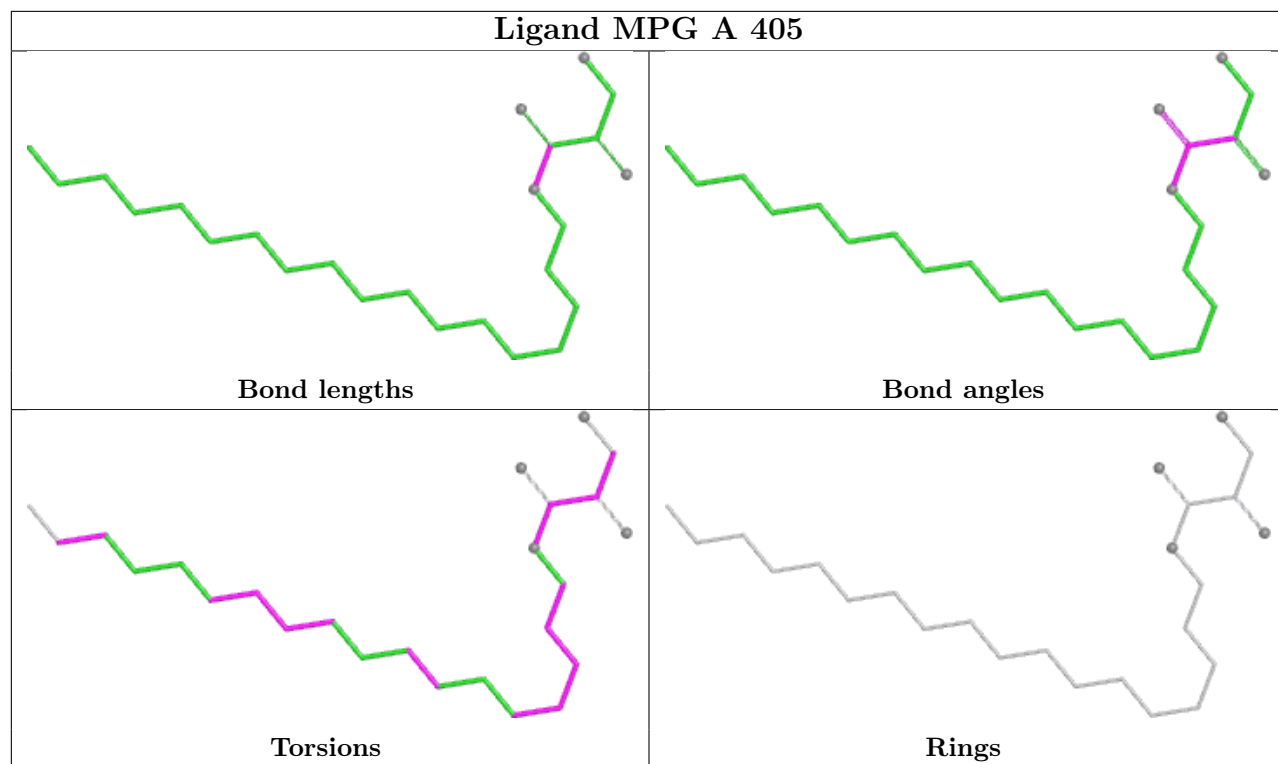
Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	404	MPG	5	0
3	A	405	MPG	1	0
3	B	407	MPG	3	0
3	A	407	MPG	1	0
3	B	405	MPG	2	0
2	A	403	SO4	3	0
3	B	410	MPG	2	0
2	B	404	SO4	1	0
3	B	409	MPG	4	0
2	B	403	SO4	3	0

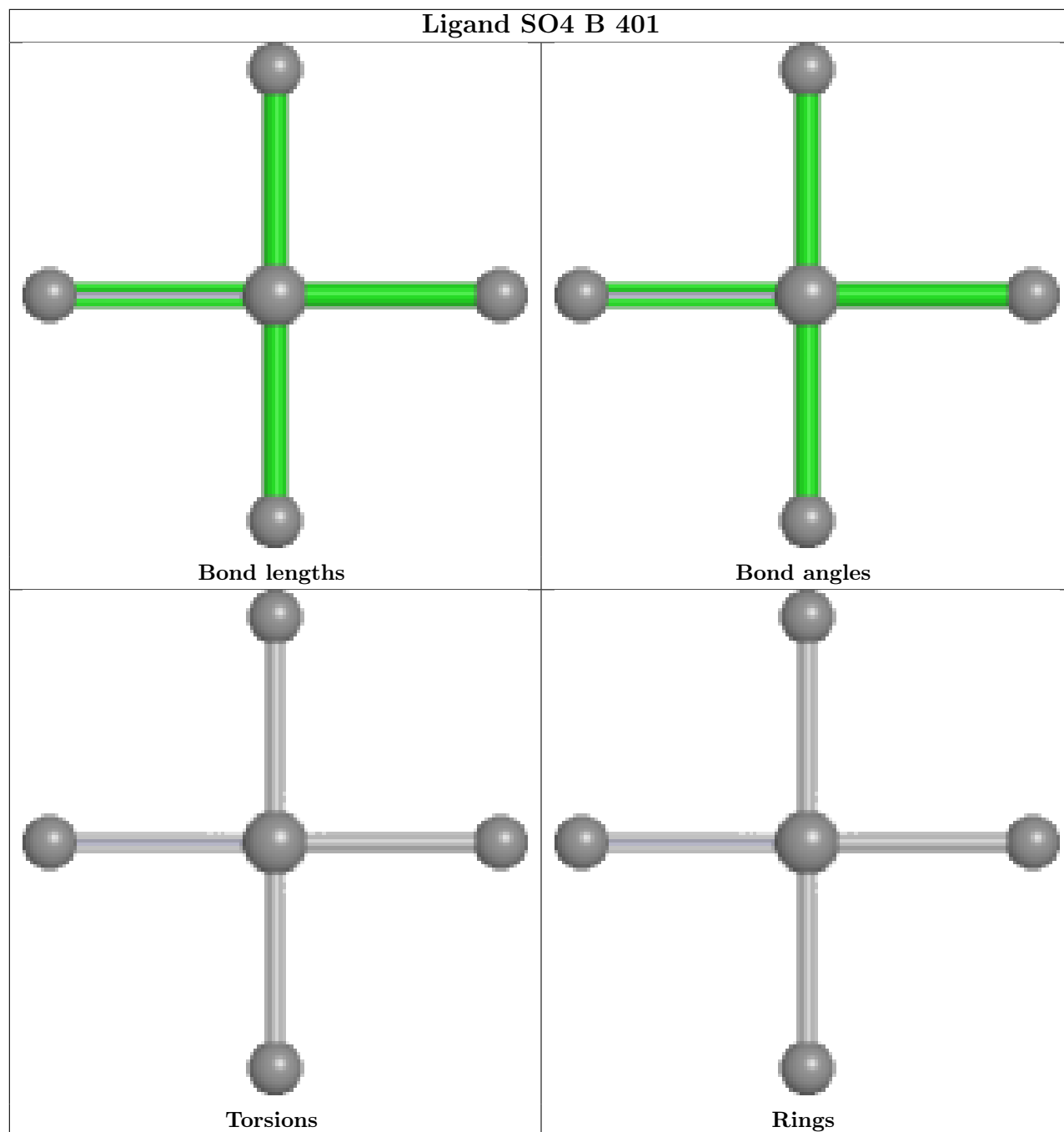
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included.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

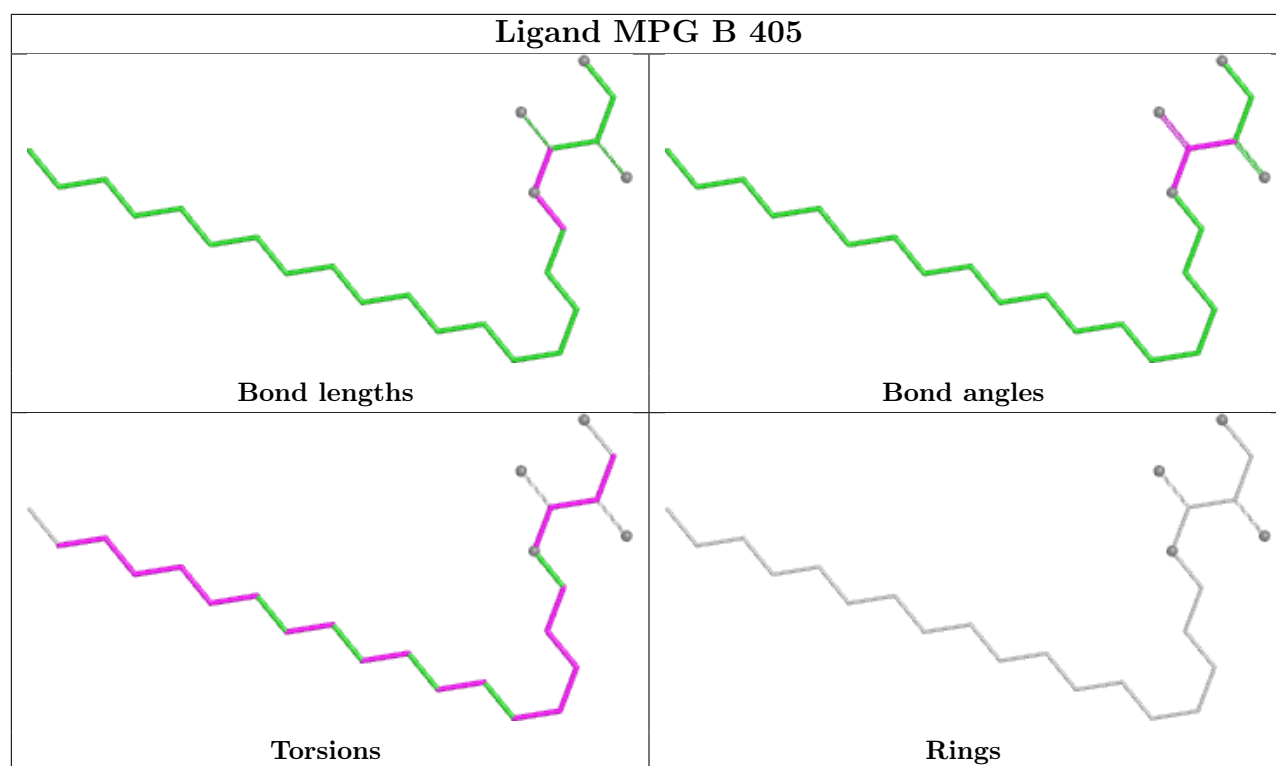
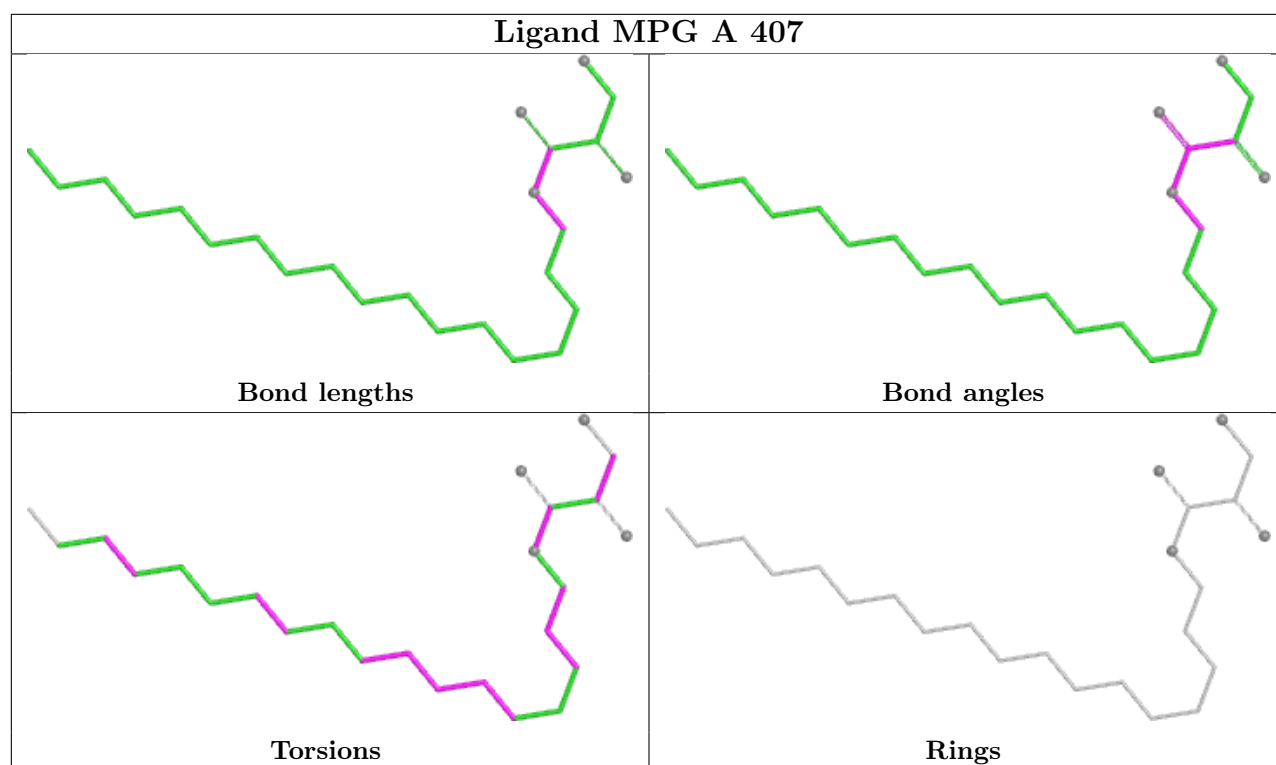
highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified 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.

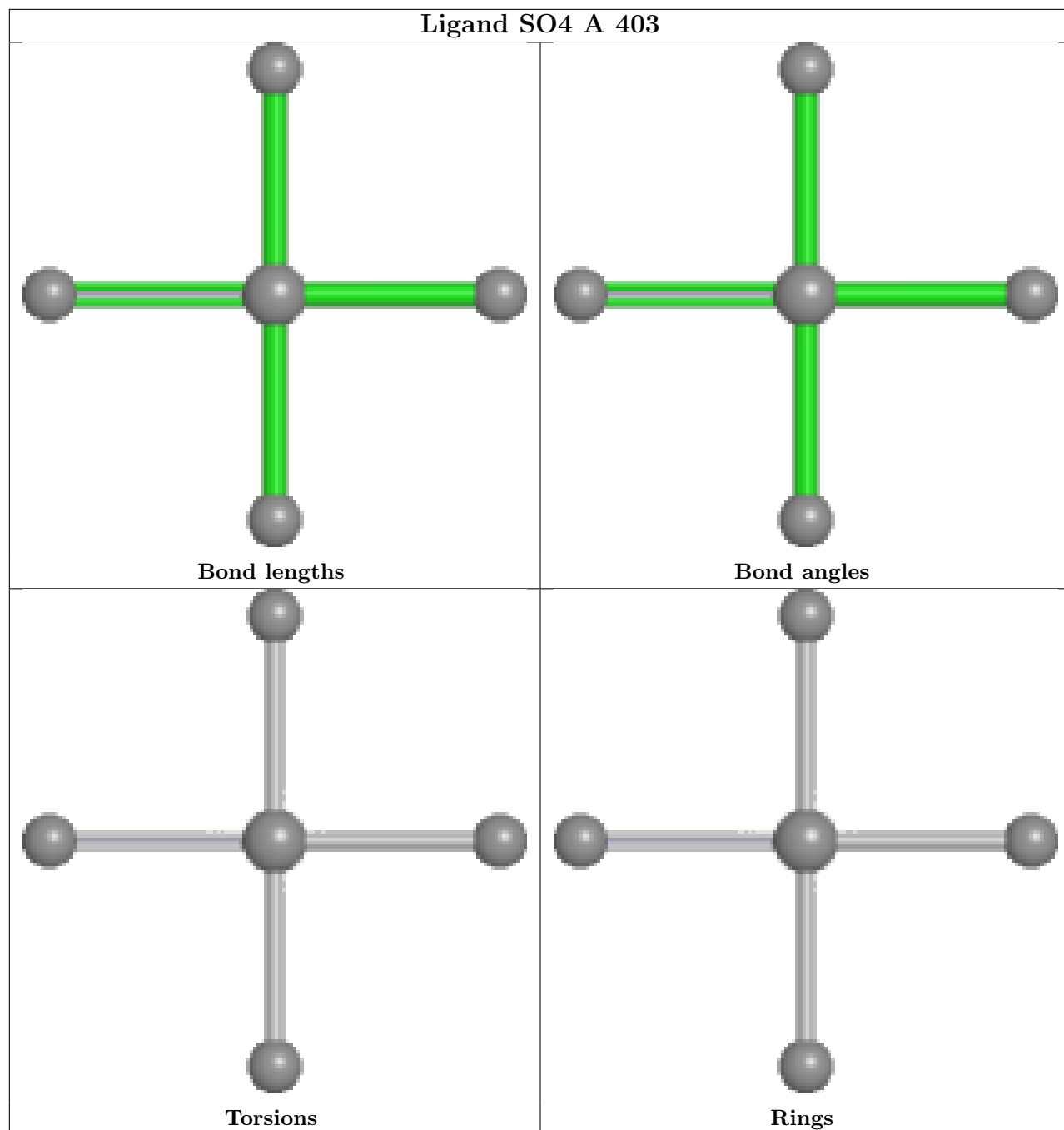


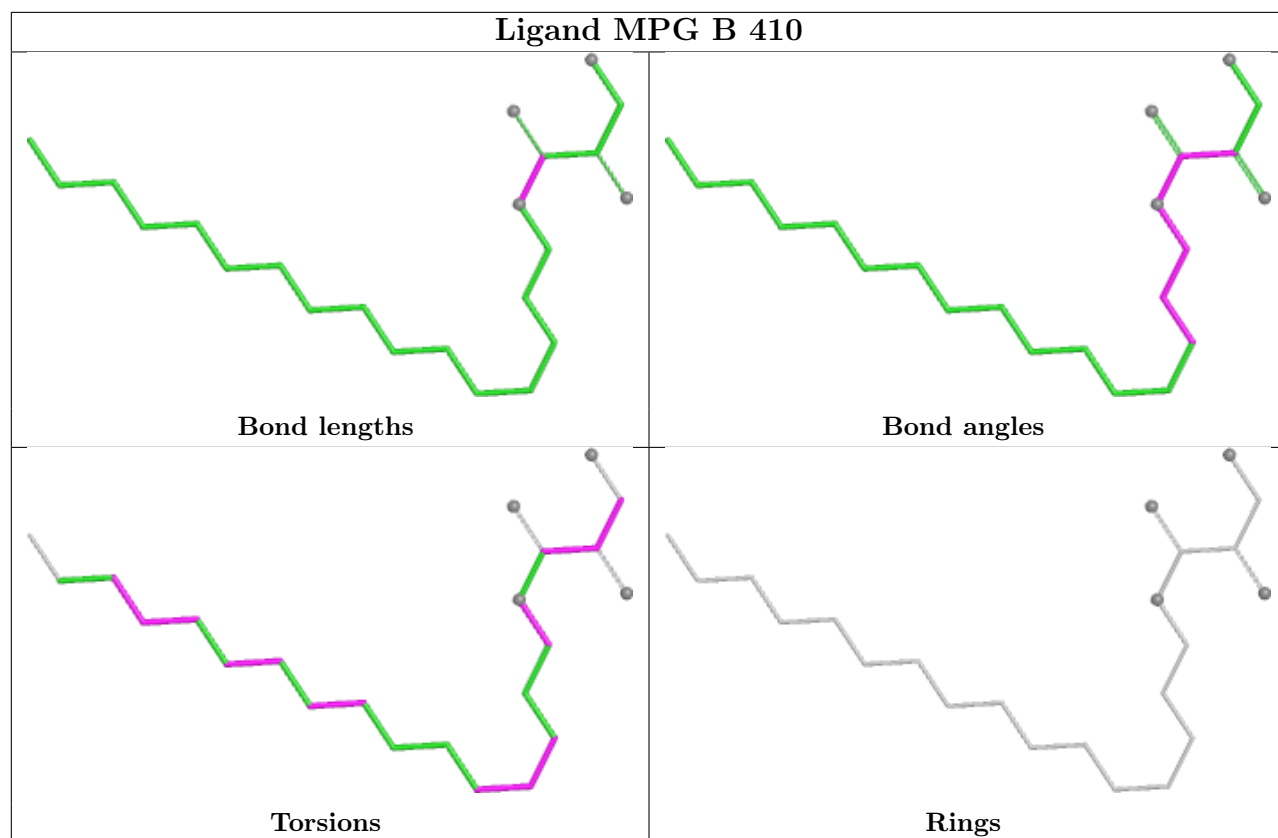
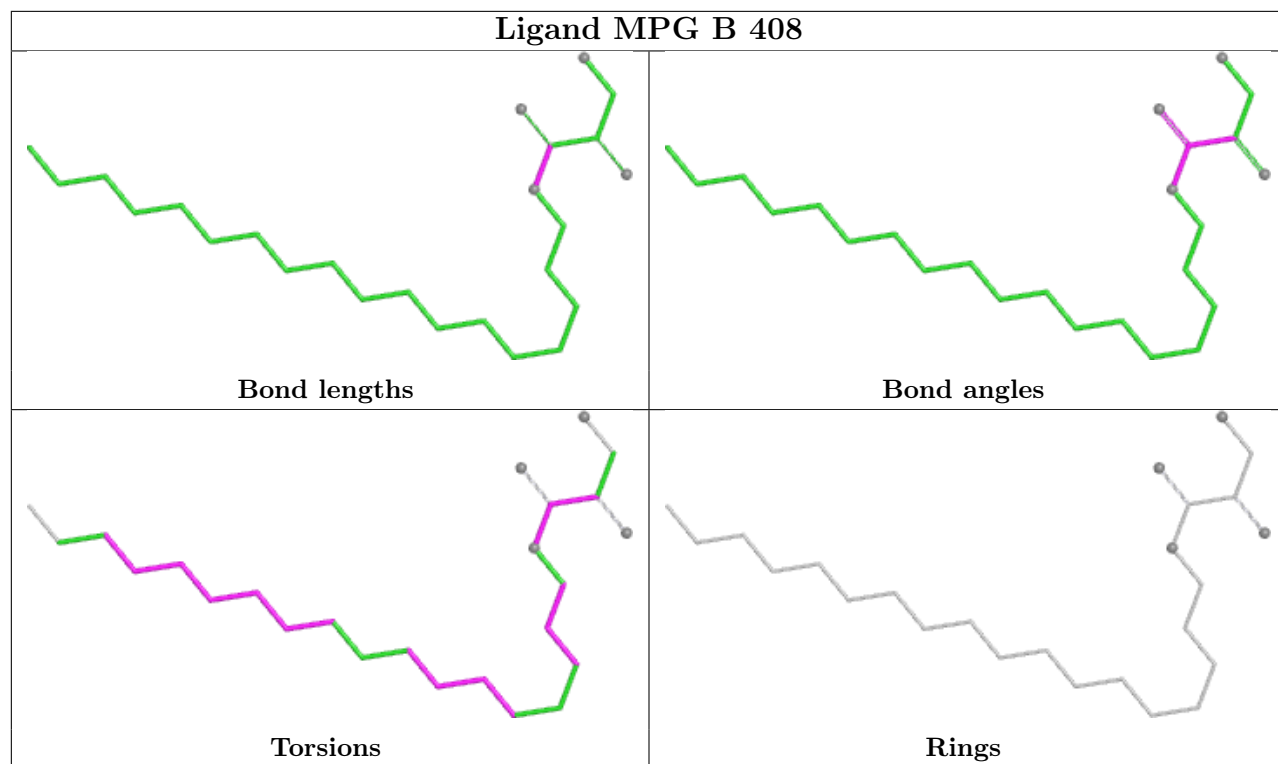


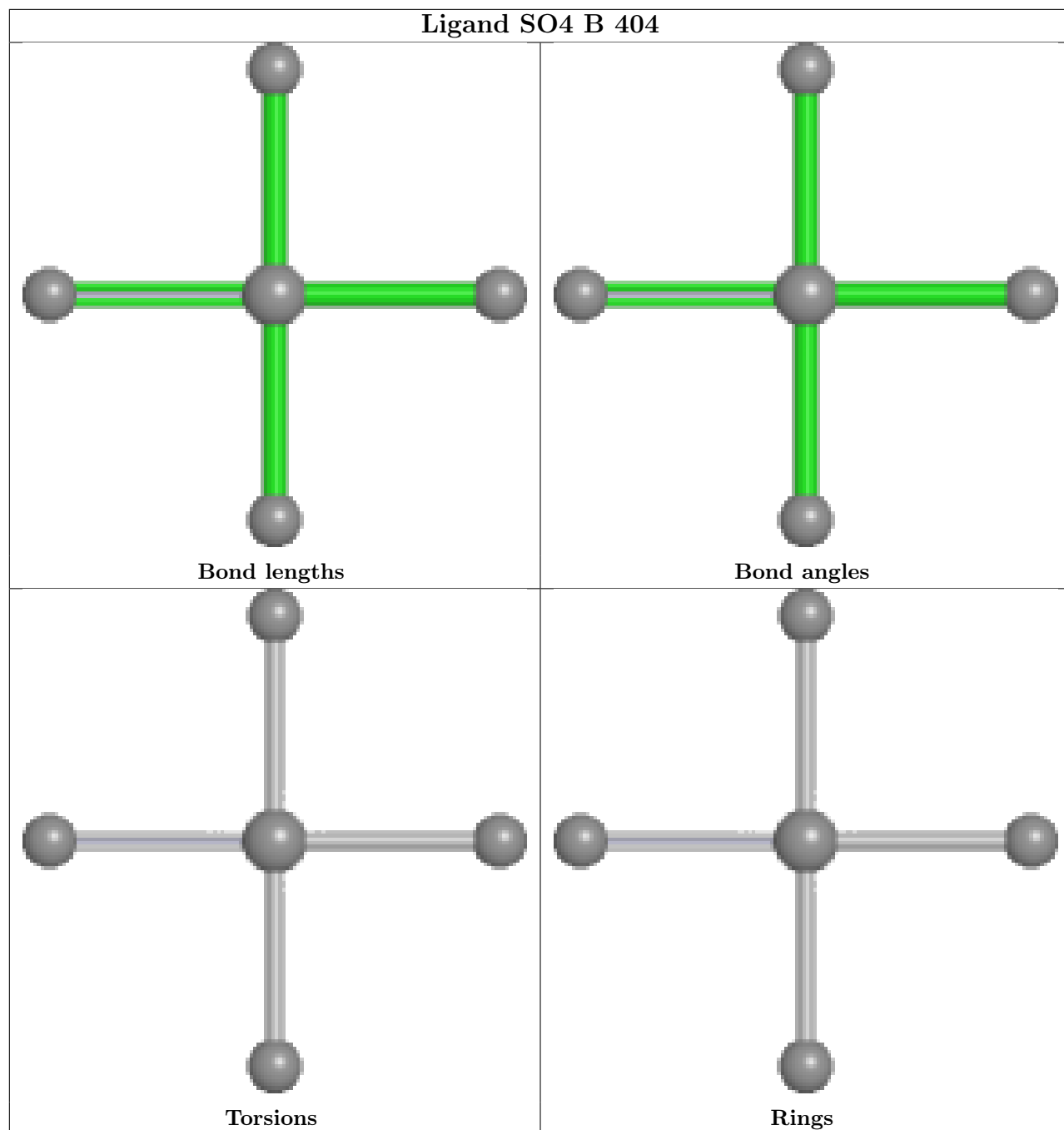


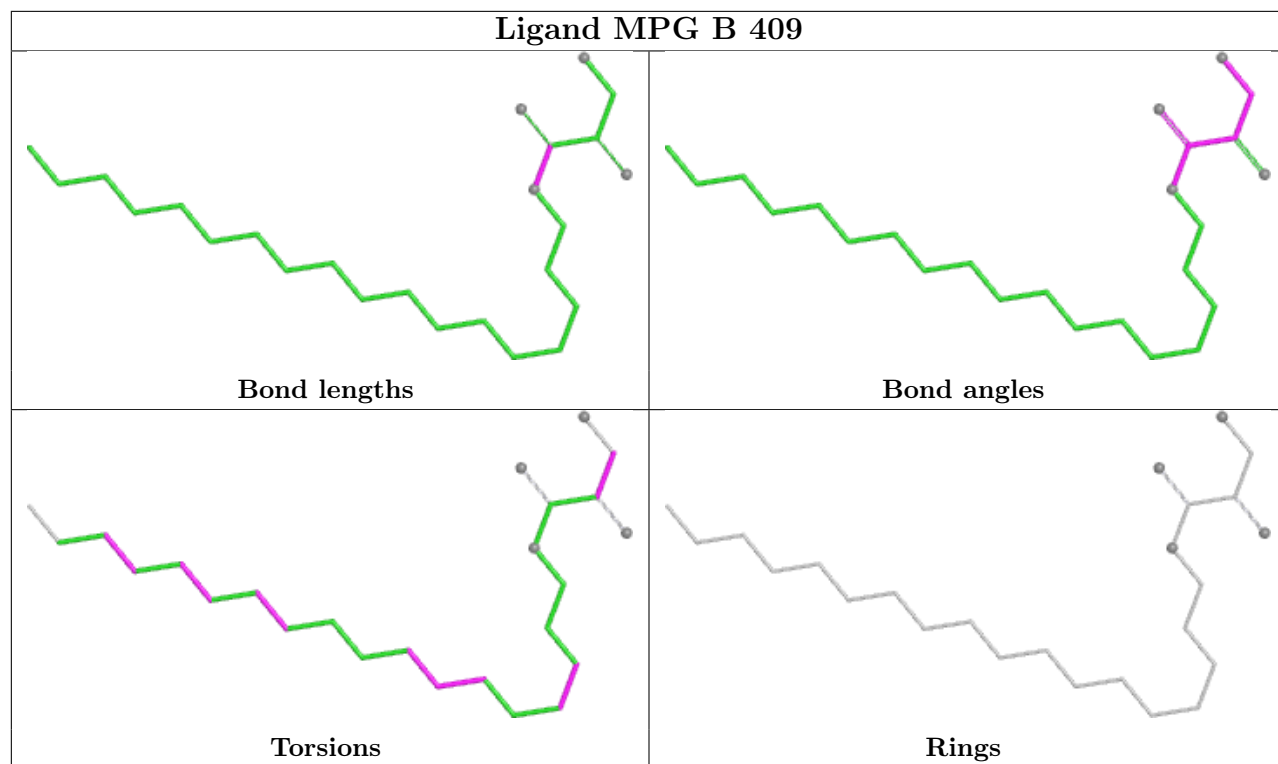


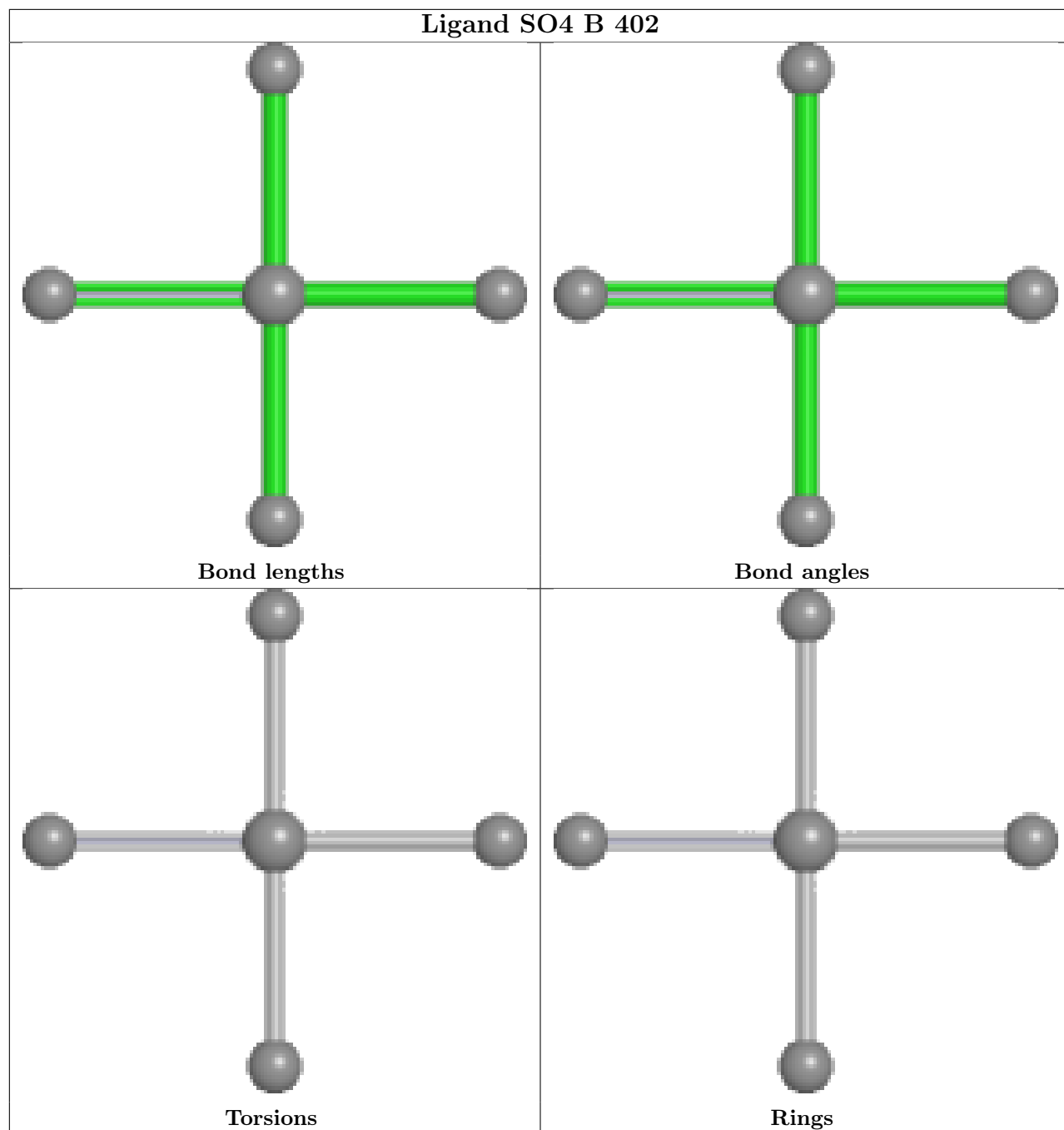


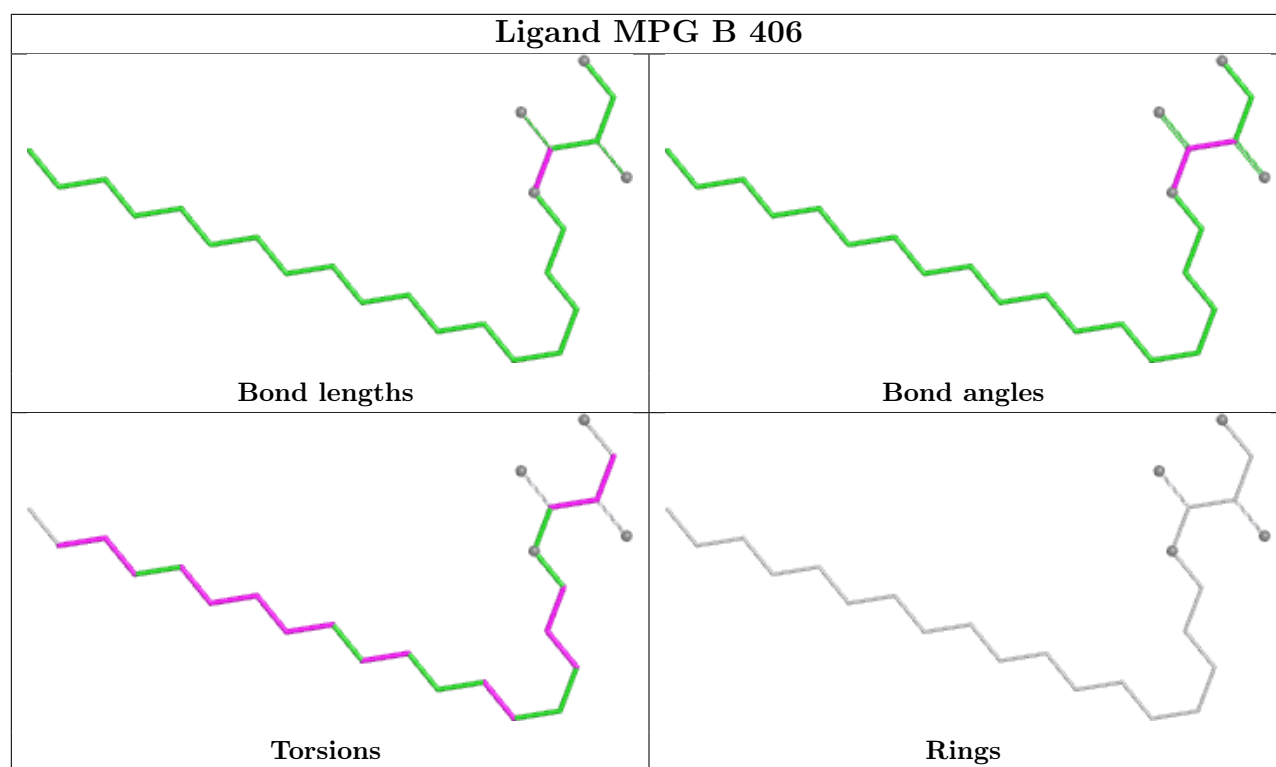


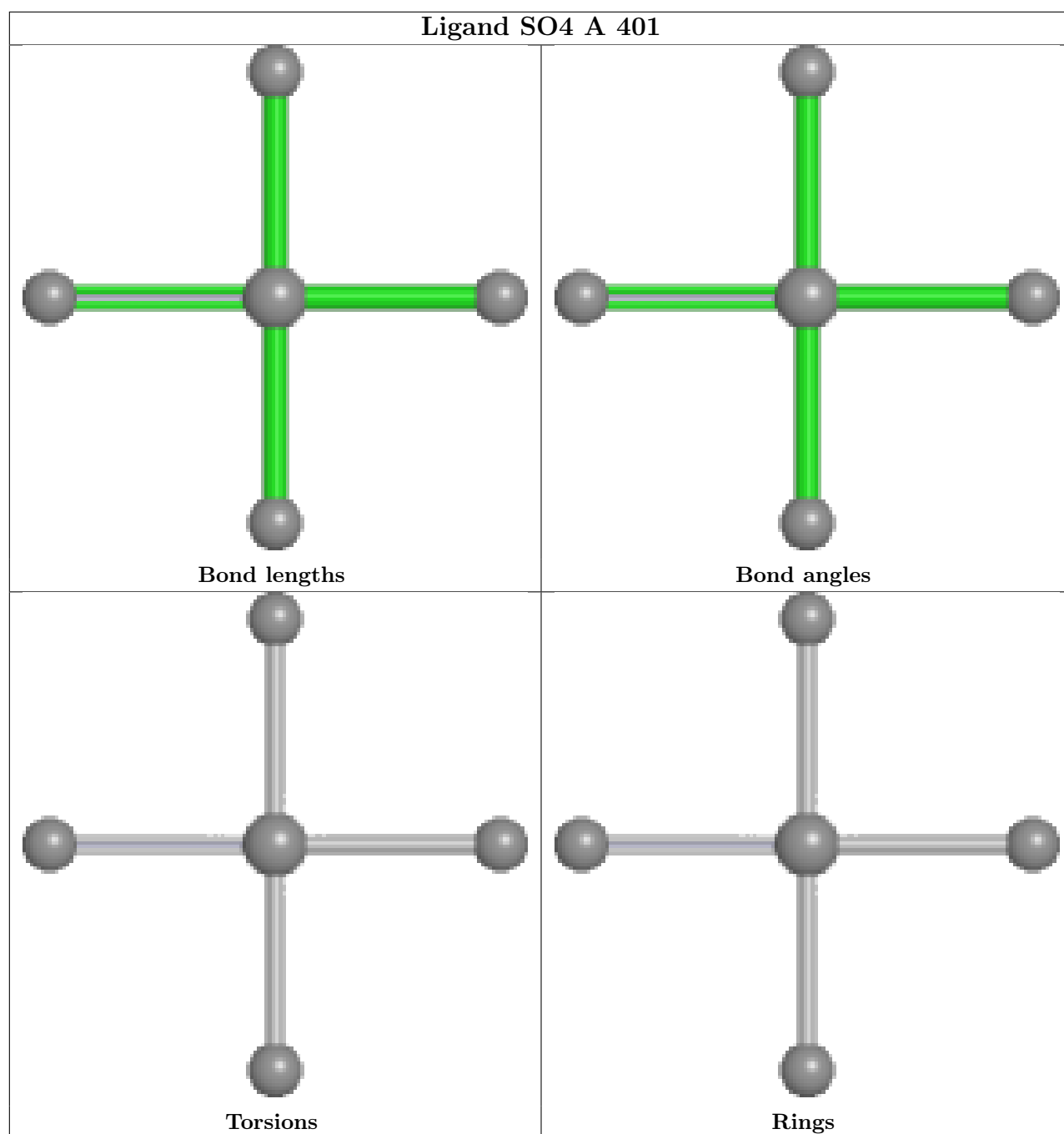


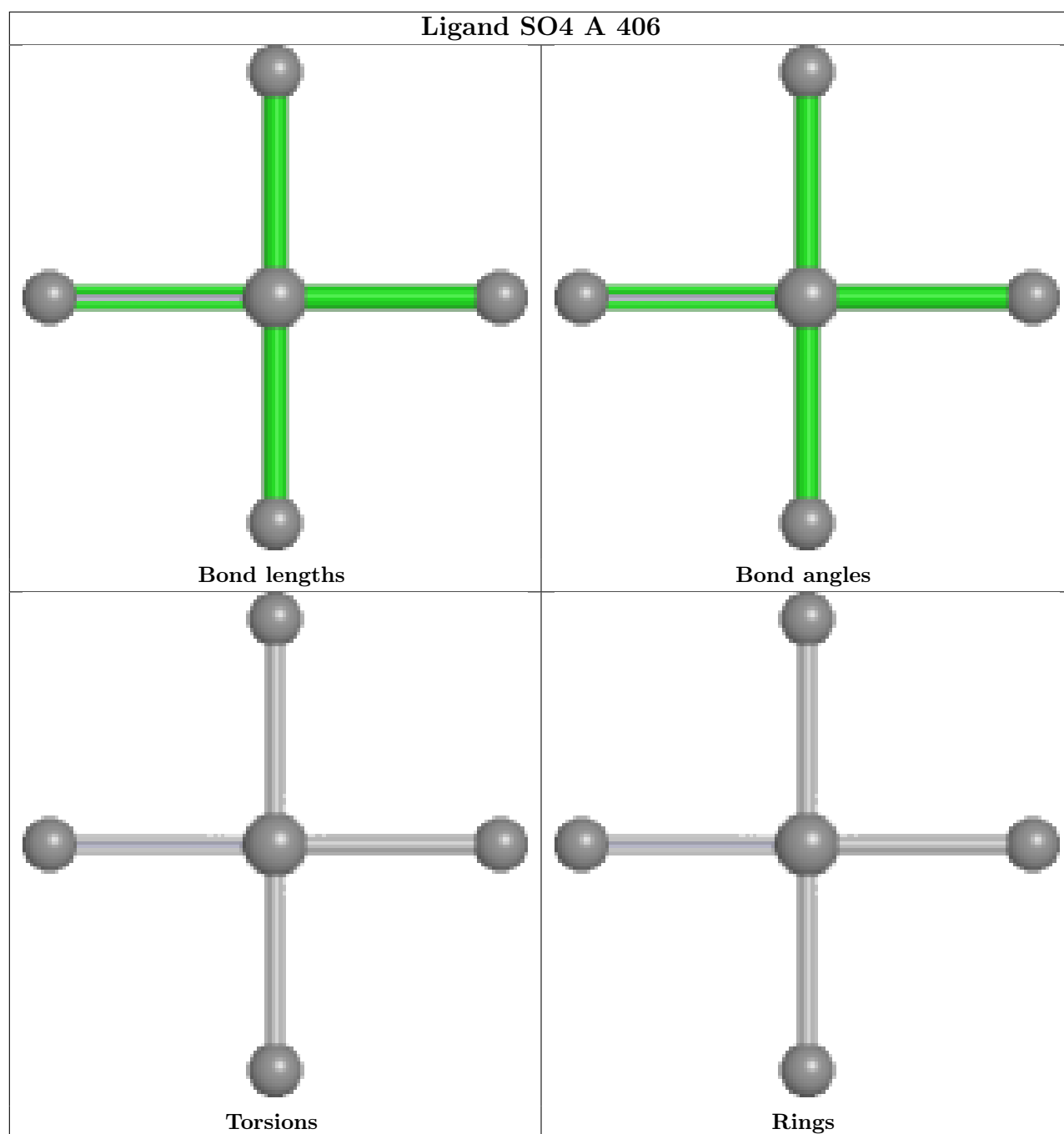


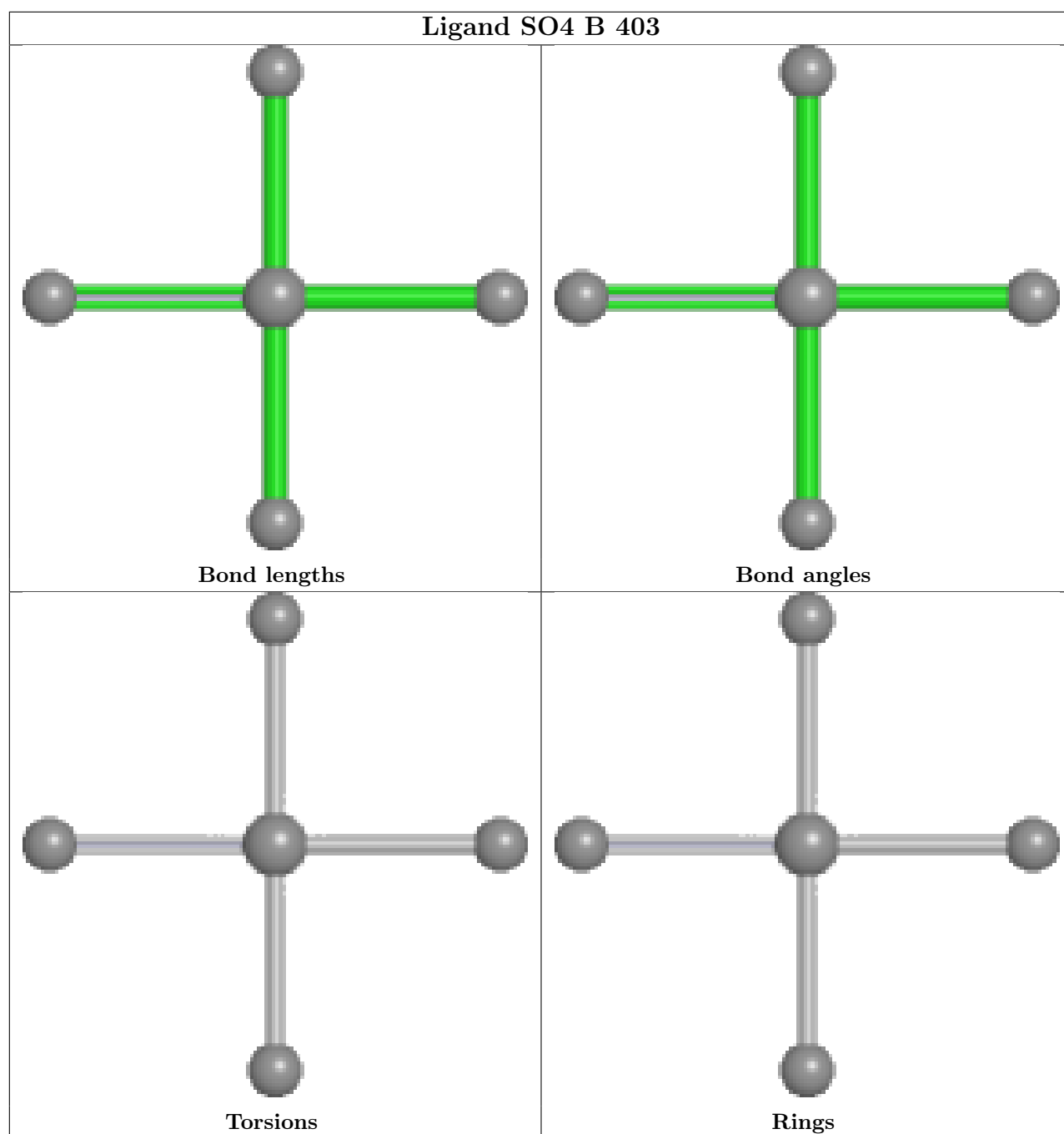












5.7 Other polymers [i](#)

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

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	295/309 (95%)	0.47	19 (6%) 25 25	35, 52, 83, 107	0
1	B	296/309 (95%)	0.55	18 (6%) 27 27	37, 52, 78, 98	0
All	All	591/618 (95%)	0.51	37 (6%) 26 26	35, 52, 80, 107	0

All (37) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	53	ARG	5.3
1	A	159	PRO	4.9
1	A	283	ARG	4.2
1	A	288	THR	3.9
1	B	287	GLU	3.9
1	B	283	ARG	3.5
1	B	81	ARG	3.4
1	A	160	GLU	3.3
1	A	289	THR	2.9
1	A	120	GLY	2.9
1	A	52	ASN	2.9
1	A	56	VAL	2.8
1	A	55	HIS	2.8
1	B	53	ARG	2.7
1	B	288	THR	2.7
1	A	81	ARG	2.6
1	B	282	HIS	2.6
1	B	159	PRO	2.6
1	B	125	ALA	2.5
1	A	125	ALA	2.5
1	B	5	SER	2.4
1	A	287	GLU	2.4
1	B	148	PRO	2.4
1	B	62	GLY	2.3

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
1	B	183	MET	2.2
1	B	80	LEU	2.2
1	A	177	HIS	2.2
1	B	51	GLU	2.2
1	B	281	THR	2.1
1	B	289	THR	2.1
1	A	51	GLU	2.1
1	A	87	THR	2.0
1	A	80	LEU	2.0
1	B	55	HIS	2.0
1	A	201	THR	2.0
1	A	308	LEU	2.0
1	B	149	HIS	2.0

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

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

6.3 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

6.4 Ligands [i](#)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 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
2	SO4	A	402	5/5	0.72	0.13	82,84,93,102	0
3	MPG	B	406	25/25	0.74	0.18	37,49,76,81	0
2	SO4	B	404	5/5	0.75	0.23	82,87,97,103	0
3	MPG	B	408	25/25	0.76	0.20	38,50,76,87	0
3	MPG	A	405	25/25	0.77	0.18	35,60,87,90	0
3	MPG	A	404	25/25	0.78	0.19	43,65,85,94	0
2	SO4	A	403	5/5	0.80	0.22	84,84,98,100	0
2	SO4	B	402	5/5	0.81	0.10	81,89,95,102	0
3	MPG	B	410	23/25	0.82	0.18	40,52,73,78	0
3	MPG	B	409	25/25	0.83	0.15	35,48,67,68	0

Continued on next page...

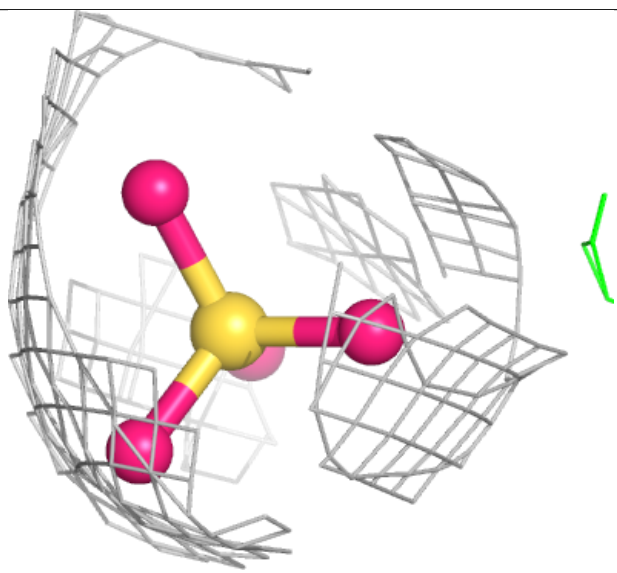
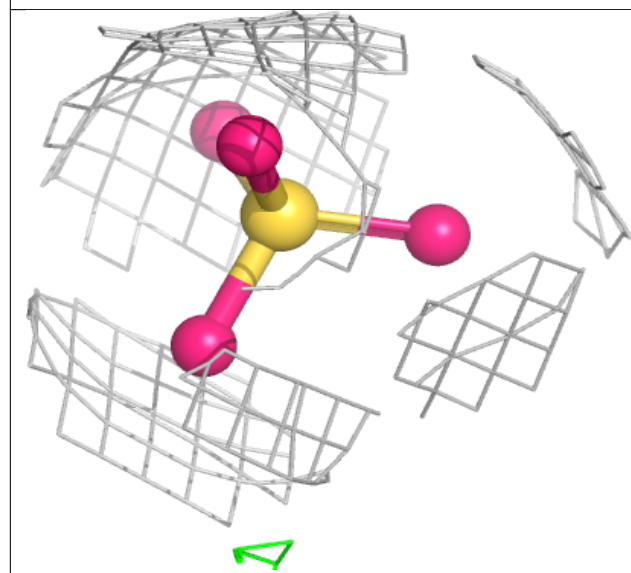
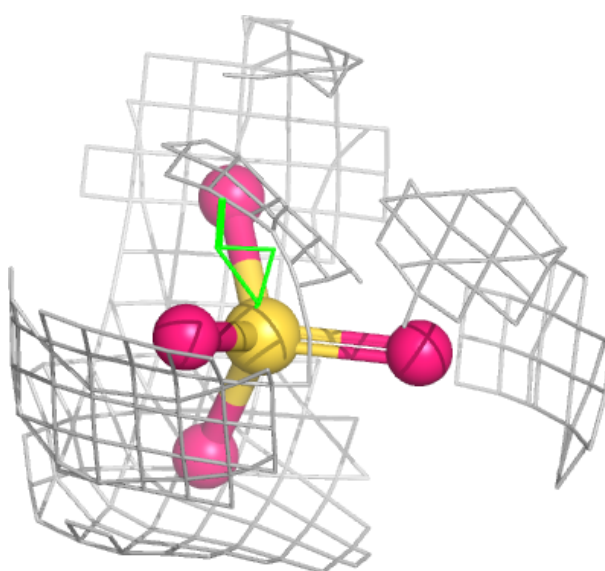
Continued from previous page...

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
2	SO4	A	406	5/5	0.87	0.13	58,58,71,83	0
3	MPG	B	407	25/25	0.88	0.15	38,55,68,73	0
3	MPG	A	407	25/25	0.89	0.15	41,46,73,81	0
3	MPG	B	405	25/25	0.90	0.15	42,53,66,67	0
2	SO4	B	401	5/5	0.93	0.10	55,55,56,70	0
2	SO4	B	403	5/5	0.93	0.11	68,73,77,78	0
2	SO4	A	401	5/5	0.98	0.06	43,43,44,47	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.

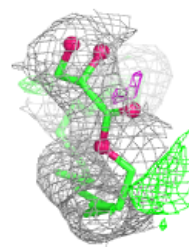
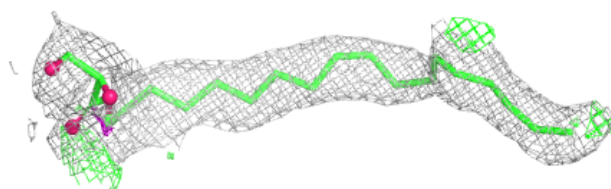
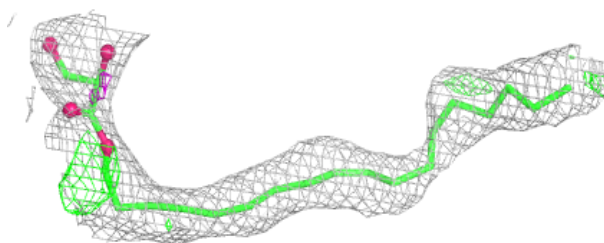
Electron density around SO4 A 402:

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



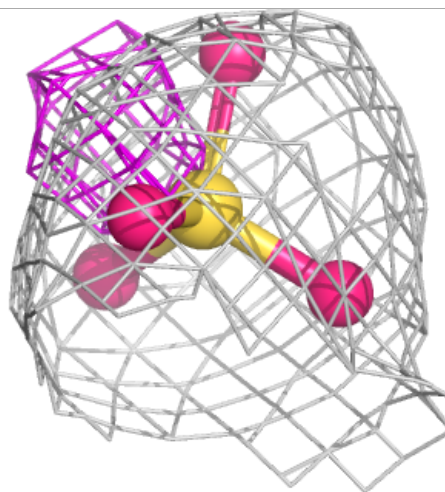
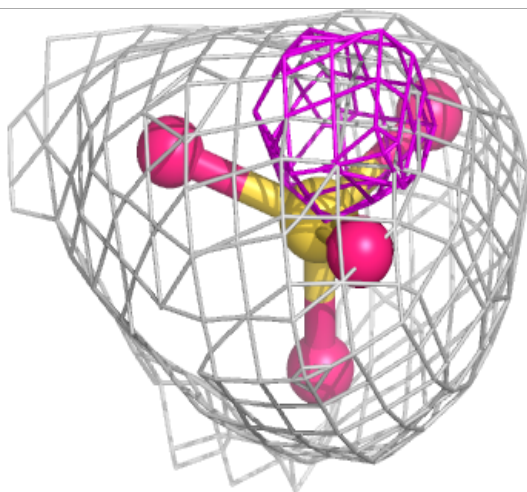
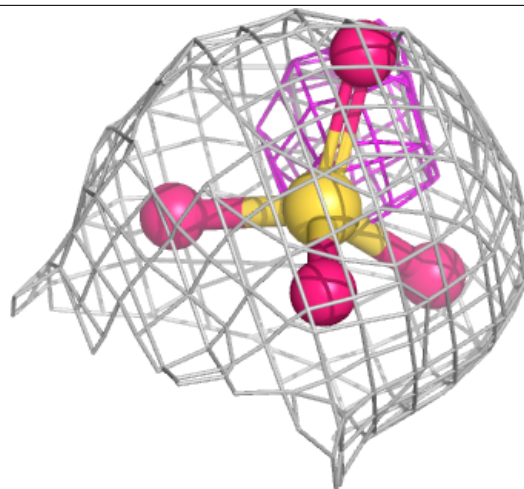
Electron density around MPG B 406:

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



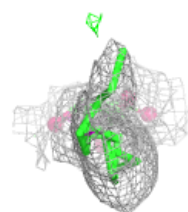
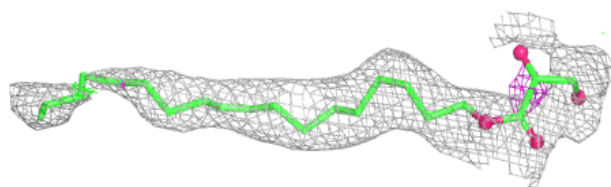
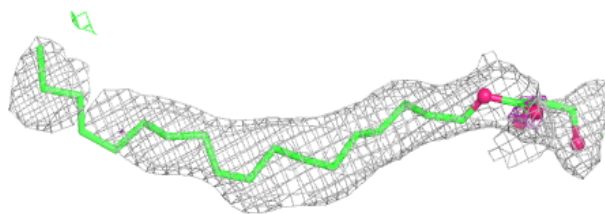
Electron density around SO4 B 404:

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

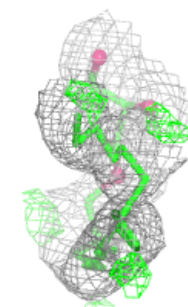
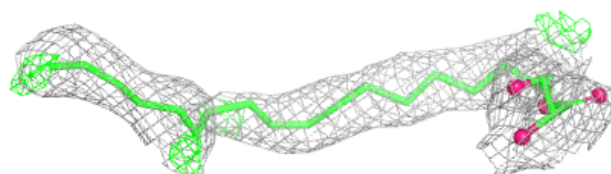
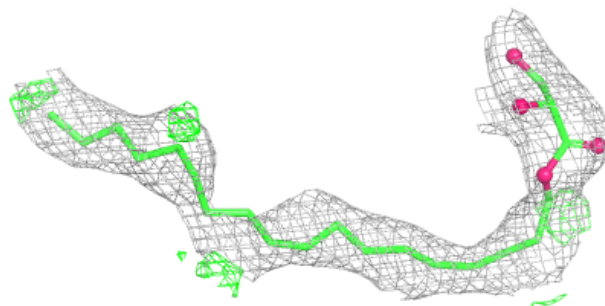


Electron density around MPG B 408:

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

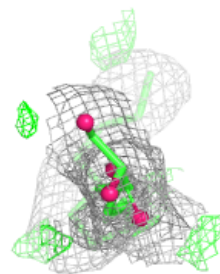
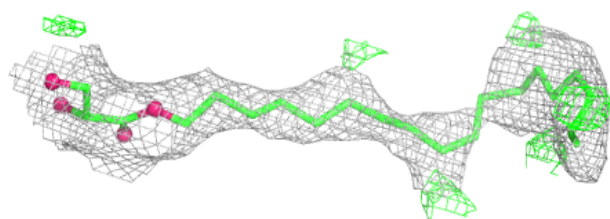
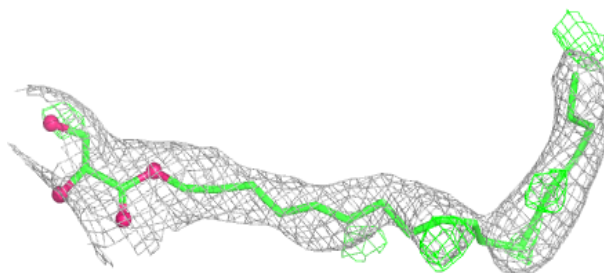
**Electron density around MPG A 405:**

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



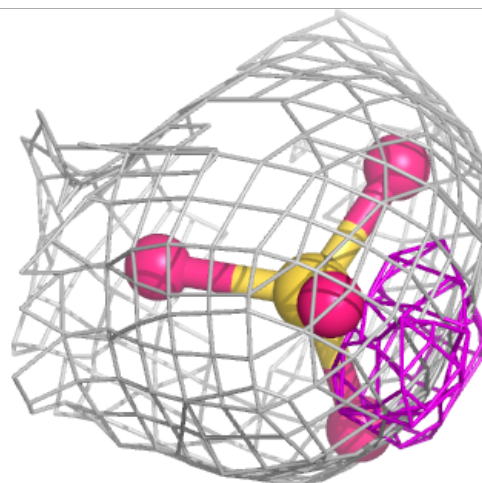
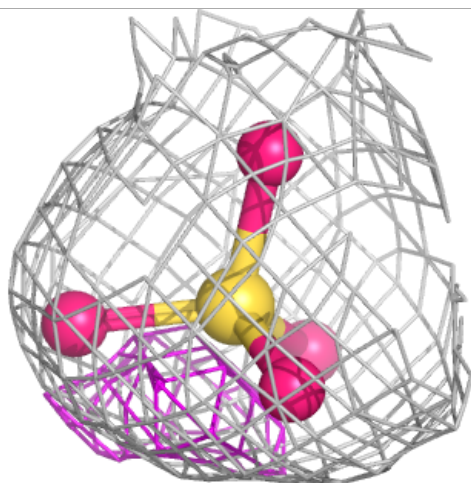
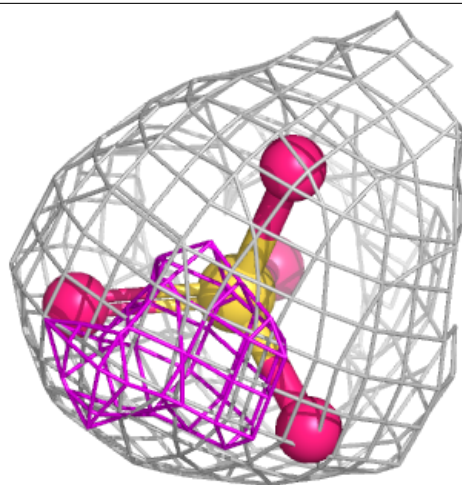
Electron density around MPG A 404:

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



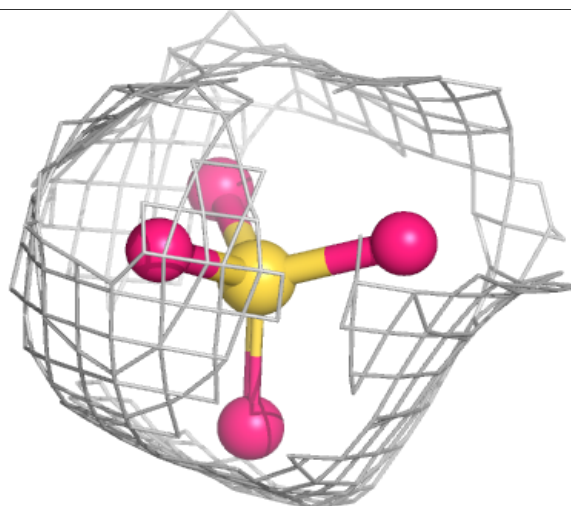
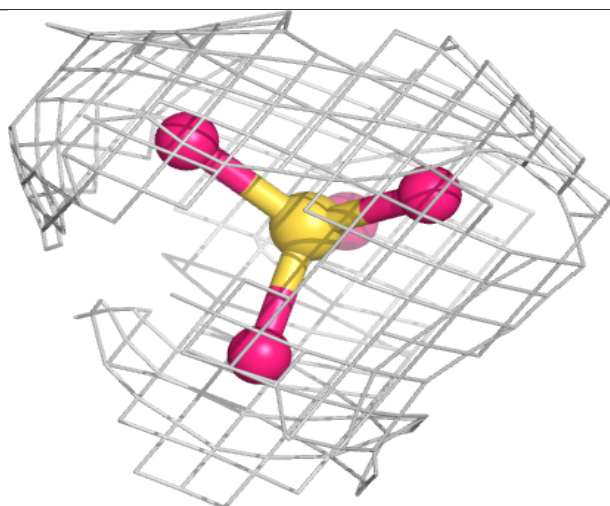
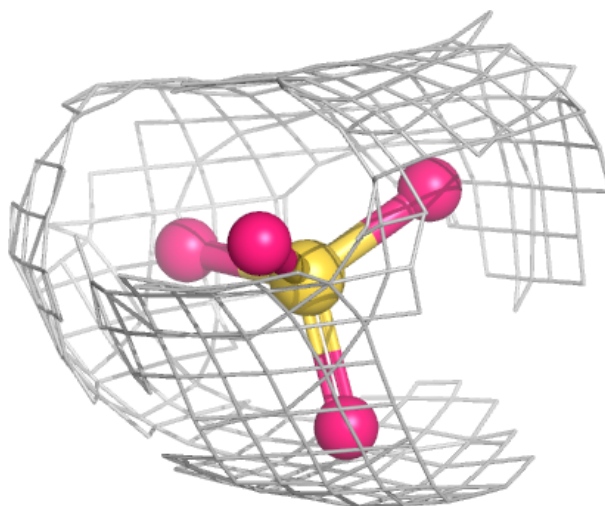
Electron density around SO4 A 403:

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



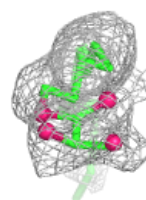
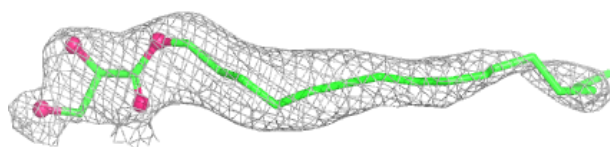
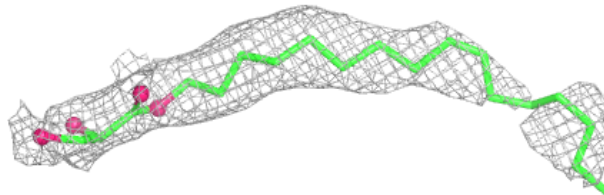
Electron density around SO4 B 402:

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

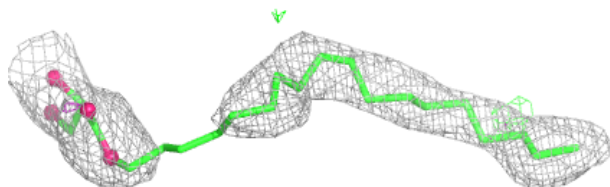
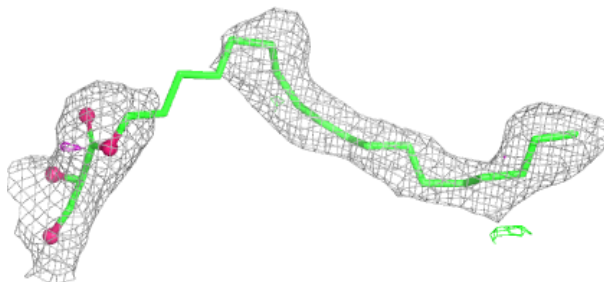


Electron density around MPG B 410:

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

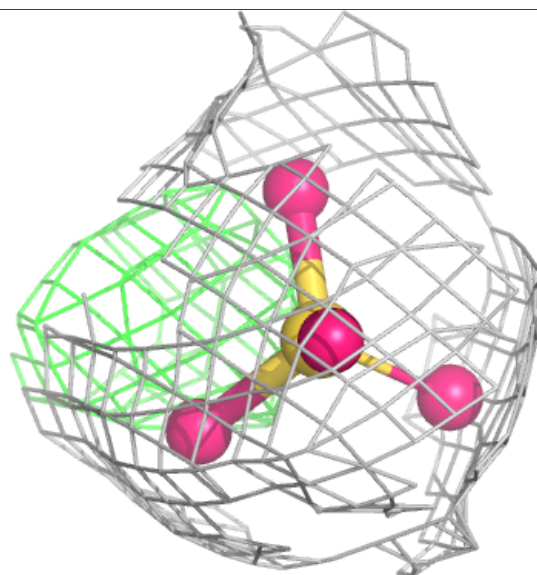
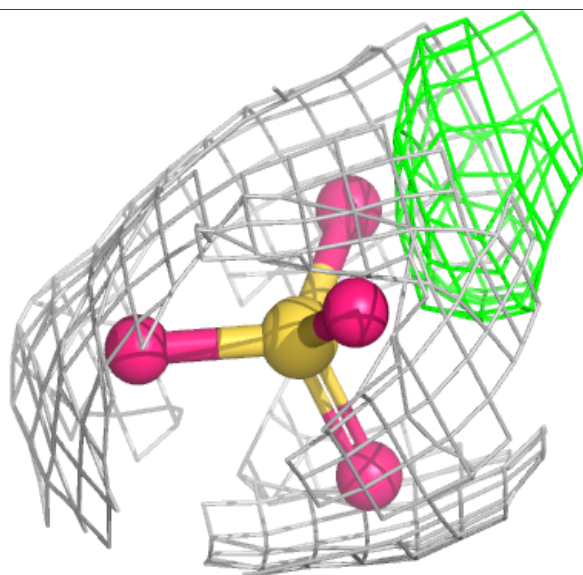
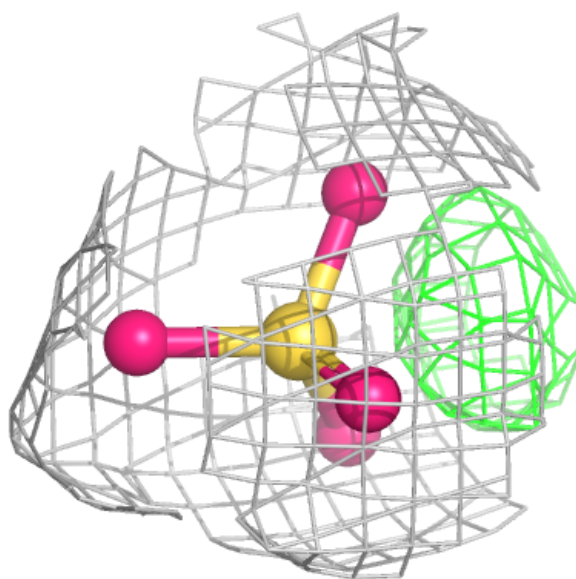
**Electron density around MPG B 409:**

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



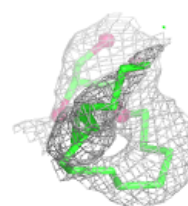
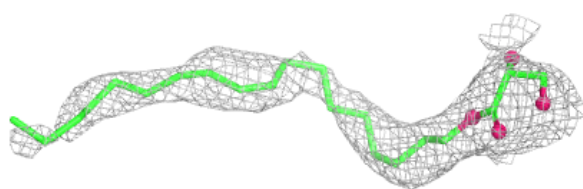
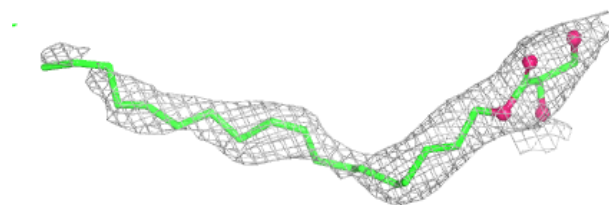
Electron density around SO4 A 406:

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

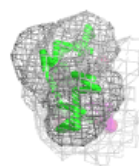
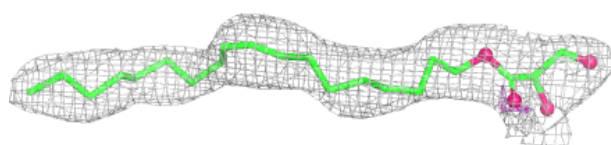
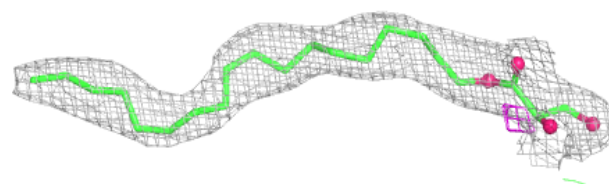


Electron density around MPG B 407:

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

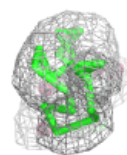
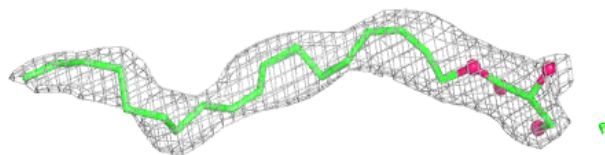
**Electron density around MPG A 407:**

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



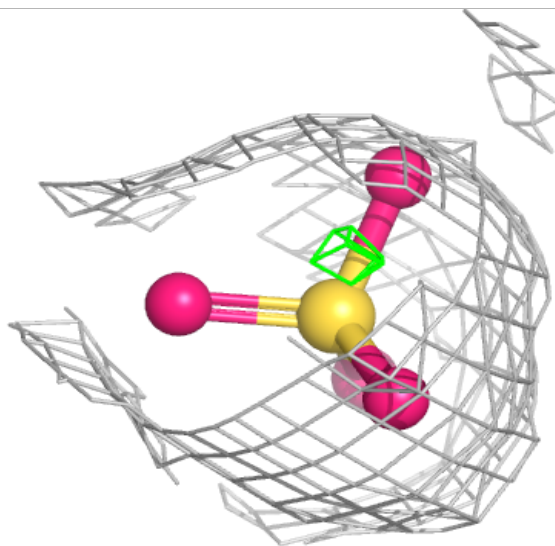
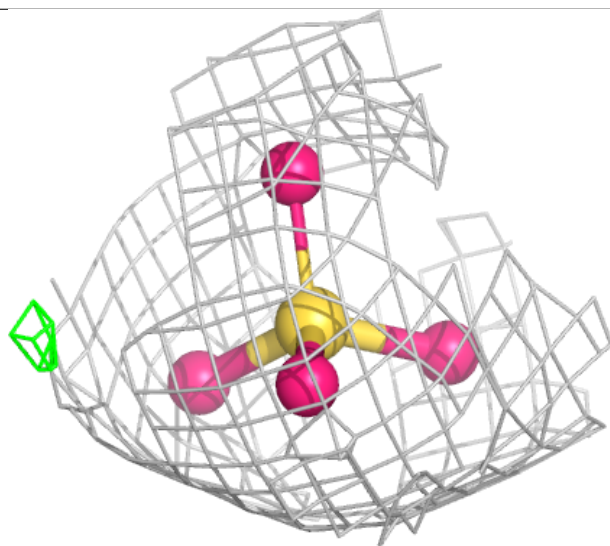
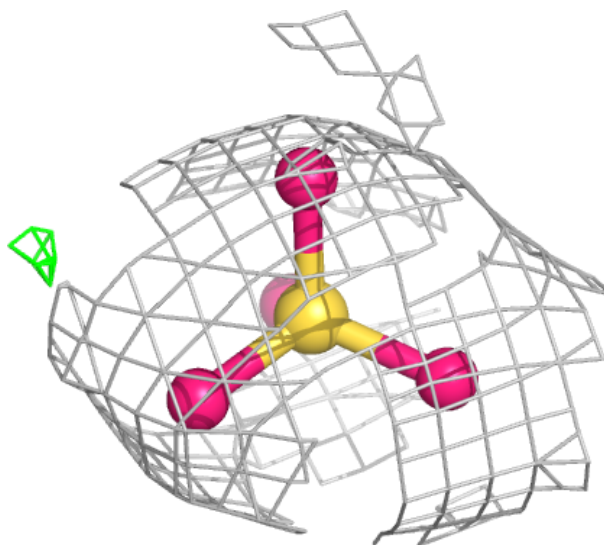
Electron density around MPG B 405:

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



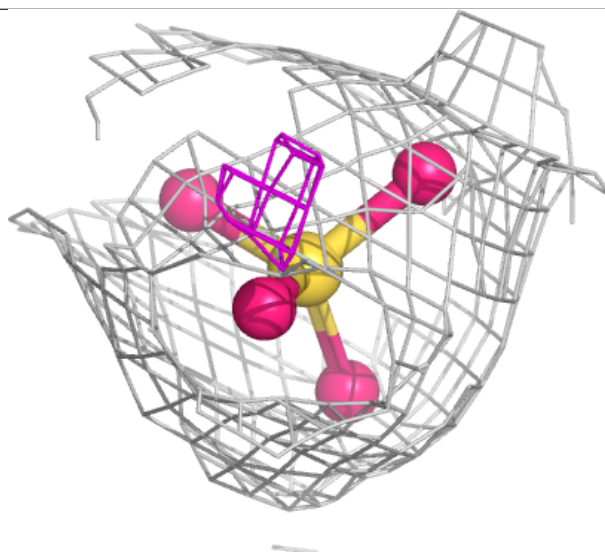
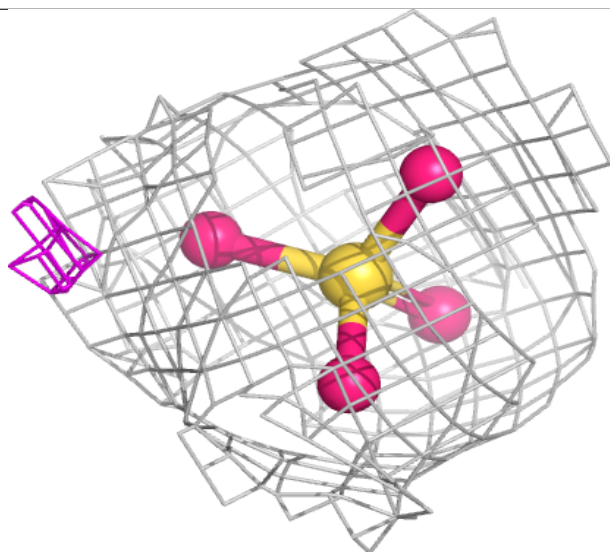
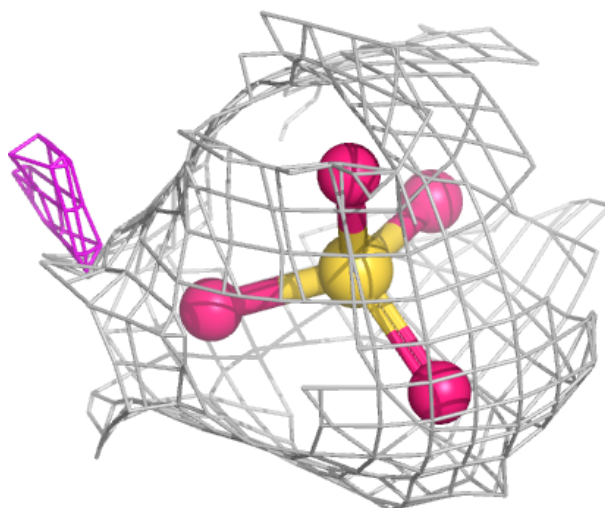
Electron density around SO4 B 401:

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



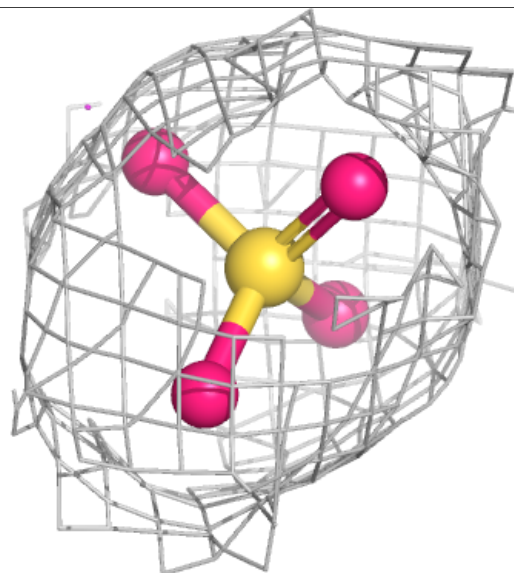
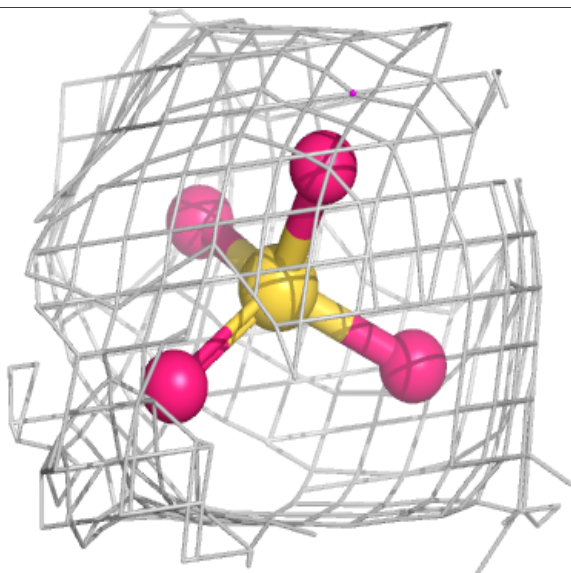
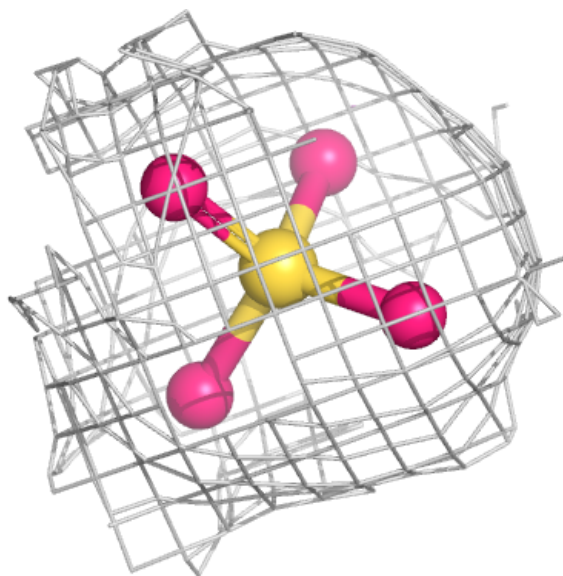
Electron density around SO4 B 403:

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



Electron density around SO4 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)



6.5 Other polymers [i](#)

There are no such residues in this entry.