



Full wwPDB X-ray Structure Validation Report ⓘ

Jul 11, 2022 – 01:35 pm BST

PDB ID : 7ZQ4
Title : Crystal structure of photosynthetic glyceraldehyde-3-phosphate dehydrogenase from *Chlamydomonas reinhardtii* (CrGAPA) complexed with NADP⁺ and the oxidated catalytic cysteine
Authors : Fermani, S.; Zaffagnini, M.; Lemaire, S.D.; Falini, G.; Fanti, S.; Rossi, J.
Deposited on : 2022-04-29
Resolution : 1.70 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 : 4.02b-467
Mogul : 1.8.4, CSD as541be (2020)
Xtriage (Phenix) : 1.13
EDS : 2.29
buster-report : 1.1.7 (2018)
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac : 5.8.0267
CCP4 : 7.1.010 (Gargrove)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.29

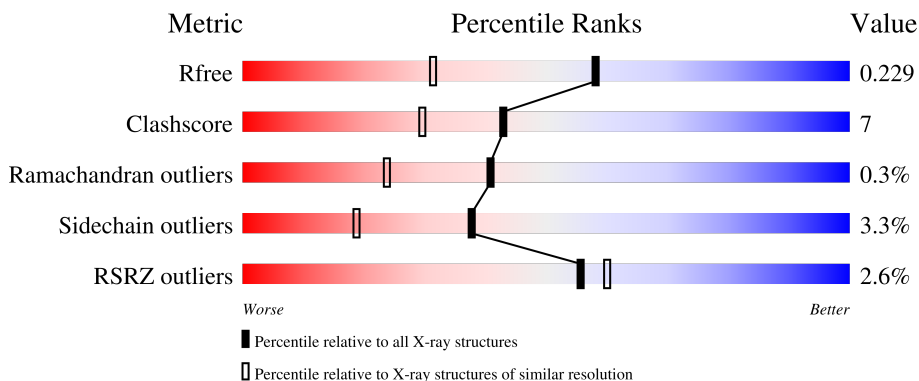
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.70 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	4298 (1.70-1.70)
Clashscore	141614	4695 (1.70-1.70)
Ramachandran outliers	138981	4610 (1.70-1.70)
Sidechain outliers	138945	4610 (1.70-1.70)
RSRZ outliers	127900	4222 (1.70-1.70)

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	O	348	
1	R	348	

2 Entry composition i

There are 6 unique types of molecules in this entry. The entry contains 5971 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 Glyceraldehyde-3-phosphate dehydrogenase A, chloroplastic.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	O	338	2593	1643	451	488	11	0	3	0
1	R	346	2665	1684	471	498	12	0	2	0

There are 16 discrepancies between the modelled and reference sequences:

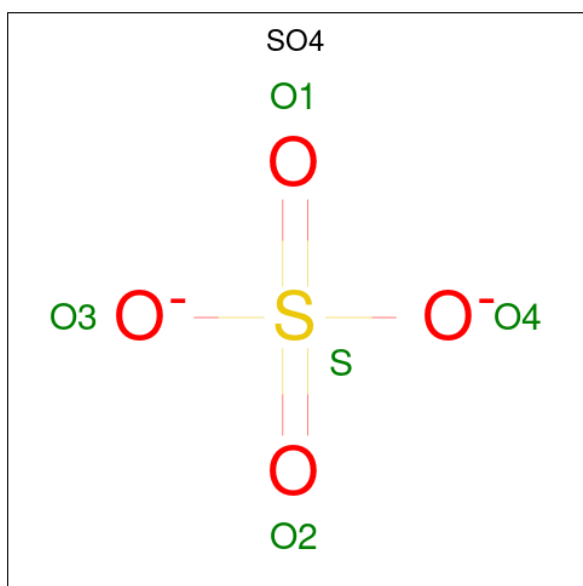
Chain	Residue	Modelled	Actual	Comment	Reference
O	-8	MET	-	initiating methionine	UNP P50362
O	-7	HIS	-	expression tag	UNP P50362
O	-6	HIS	-	expression tag	UNP P50362
O	-5	HIS	-	expression tag	UNP P50362
O	-4	HIS	-	expression tag	UNP P50362
O	-3	HIS	-	expression tag	UNP P50362
O	-2	HIS	-	expression tag	UNP P50362
O	-1	MET	-	expression tag	UNP P50362
R	-7	MET	-	initiating methionine	UNP P50362
R	-6	HIS	-	expression tag	UNP P50362
R	-5	HIS	-	expression tag	UNP P50362
R	-4	HIS	-	expression tag	UNP P50362
R	-3	HIS	-	expression tag	UNP P50362
R	-2	HIS	-	expression tag	UNP P50362
R	-1	HIS	-	expression tag	UNP P50362
R	0	MET	-	expression tag	UNP P50362

- Molecule 2 is NADPH DIHYDRO-NICOTINAMIDE-ADENINE-DINUCLEOTIDE PHOSPHATE (three-letter code: NDP) (formula: C₂₁H₃₀N₇O₁₇P₃) (labeled as "Ligand of Interest" by depositor).



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

- Molecule 3 is SULFATE ION (three-letter code: SO4) (formula: O₄S) (labeled as "Ligand of Interest" by depositor).



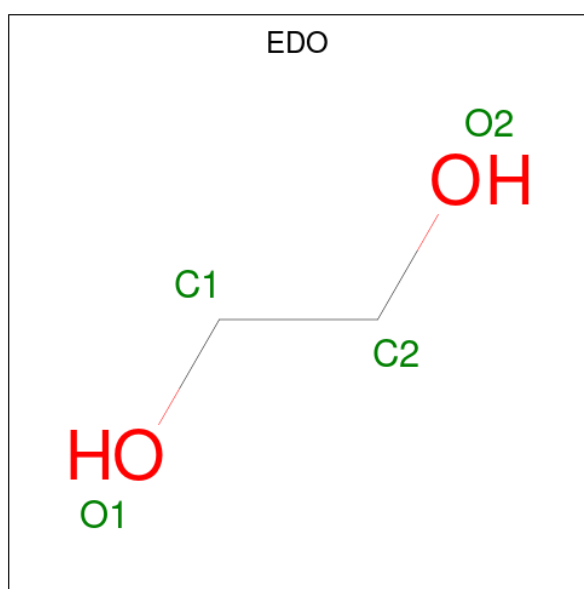
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf	
			Total	O			S
3	O	1	5	4	1	0	0

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Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	O	1	Total O S 5 4 1	0	0
3	O	1	Total O S 5 4 1	0	0
3	O	1	Total O S 5 4 1	0	0
3	R	1	Total O S 5 4 1	0	0
3	R	1	Total O S 5 4 1	0	0
3	R	1	Total O S 5 4 1	0	0

- Molecule 4 is 1,2-ETHANEDIOL (three-letter code: EDO) (formula: C₂H₆O₂) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	O	1	Total C O 4 2 2	0	0

- Molecule 5 is GLYCEROL (three-letter code: GOL) (formula: C₃H₈O₃) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	R	1	Total C O 6 3 3	0	0

- Molecule 6 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	O	284	Total O 284 284	0	0
6	R	288	Total O 288 288	0	0

4 Data and refinement statistics i

Property	Value	Source
Space group	C 2 2 2	Depositor
Cell constants a, b, c, α , β , γ	142.40Å 147.33Å 74.76Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	45.18 – 1.70 46.43 – 1.70	Depositor EDS
% Data completeness (in resolution range)	97.5 (45.18-1.70) 88.1 (46.43-1.70)	Depositor EDS
R_{merge}	0.08	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.39 (at 1.70Å)	Xtrriage
Refinement program	PHENIX 1.19	Depositor
R, R_{free}	0.217 , 0.229 0.216 , 0.229	Depositor DCC
R_{free} test set	4226 reflections (5.02%)	wwPDB-VP
Wilson B-factor (Å ²)	25.1	Xtrriage
Anisotropy	0.390	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	(Not available) , (Not available)	EDS
L-test for twinning ²	$\langle L \rangle = 0.44$, $\langle L^2 \rangle = 0.26$	Xtrriage
Estimated twinning fraction	0.105 for -k,-h,-l	Xtrriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	5971	wwPDB-VP
Average B, all atoms (Å ²)	31.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.44% 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: OCS, EDO, SO4, GOL, 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	O	0.29	0/2637	0.58	0/3576
1	R	0.30	0/2712	0.59	2/3677 (0.1%)
All	All	0.30	0/5349	0.59	2/7253 (0.0%)

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	R	61	ASP	CB-CG-OD2	5.83	123.55	118.30
1	R	221	LEU	CB-CG-CD1	-5.17	102.22	111.00

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	O	2593	0	2661	41	0
1	R	2665	0	2707	32	0
2	O	48	0	26	4	0
2	R	48	0	26	2	0
3	O	20	0	0	1	0
3	R	15	0	0	0	0
4	O	4	0	6	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
5	R	6	0	8	1	0
6	O	284	0	0	11	1
6	R	288	0	0	5	0
All	All	5971	0	5434	74	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 7.

All (74) 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:O:139:HIS:CD2	1:O:332:TRP:HA	2.22	0.75
1:O:123:LYS:NZ	6:O:505:HOH:O	2.23	0.71
1:O:21:GLN:H	1:O:21:GLN:CD	1.94	0.71
1:R:268:LYS:NZ	6:R:504:HOH:O	2.24	0.71
2:O:401:NDP:O3X	6:O:501:HOH:O	2.09	0.70
1:R:247:GLU:OE2	6:R:501:HOH:O	2.10	0.70
3:O:405:SO4:O3	6:O:502:HOH:O	2.10	0.67
1:O:1(A):LYS:N	6:O:506:HOH:O	2.24	0.67
1:O:10:ARG:NH2	1:O:47:ASP:OD2	2.31	0.61
1:O:139:HIS:HD2	1:O:332:TRP:HA	1.63	0.60
5:R:405:GOL:O3	6:R:502:HOH:O	2.16	0.60
1:O:10:ARG:HH22	1:O:47:ASP:CG	2.04	0.59
1:R:1(B):LYS:HE2	1:R:23:THR:O	2.03	0.59
1:R:115:LYS:NZ	1:R:141:TYR:O	2.36	0.58
1:O:34:GLY:CA	1:O:39:GLN:HG3	2.35	0.56
1:O:84:TRP:HB3	1:O:89:ILE:HB	1.87	0.55
1:O:33:SER:HA	1:O:75:SER:OG	2.07	0.55
1:O:154:LEU:HD23	1:O:214:VAL:HG21	1.88	0.55
1:R:82:LEU:HD13	1:R:84:TRP:CZ2	2.43	0.54
1:O:181:ASP:OD2	1:O:195:ARG:NH1	2.35	0.54
1:R:-6:HIS:NE2	6:R:503:HOH:O	2.23	0.53
1:R:332:TRP:CD1	1:R:333:VAL:HG23	2.43	0.53
1:O:80:LEU:HG	1:O:107:LYS:HD3	1.90	0.53
1:O:212:LYS:NZ	6:O:512:HOH:O	2.40	0.53
1:O:122(B):ASP:HB3	1:O:124:ASP:OD1	2.09	0.53
1:O:34:GLY:HA3	1:O:39:GLN:HG3	1.90	0.53
1:R:149:OCS:OD3	1:R:313:ASN:HB2	2.10	0.52
1:O:101:ASP:OD1	1:O:104:GLY:N	2.29	0.51
1:R:77:ARG:N	1:R:77:ARG:HD2	2.25	0.51
1:R:9:GLY:O	1:R:13:ARG:HG3	2.11	0.50

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:R:236:THR:HG23	1:R:237:VAL:HG23	1.95	0.49
1:R:100:ILE:HD12	1:R:122(A):LYS:HB2	1.95	0.49
1:O:149:OCS:OD2	2:O:401:NDP:H41N	2.13	0.49
1:O:10:ARG:HD3	1:O:314:GLU:OE2	2.13	0.48
1:O:330:LYS:NZ	6:O:509:HOH:O	2.27	0.48
1:R:77:ARG:HD2	1:R:77:ARG:H	1.78	0.48
1:O:142:PRO:HD2	6:O:594:HOH:O	2.14	0.48
1:O:176:HIS:HB3	1:O:231:ARG:HD3	1.96	0.48
1:R:240:VAL:HG23	1:R:311:TYR:CE1	2.49	0.47
1:R:77:ARG:H	1:R:77:ARG:CD	2.27	0.47
1:R:154:LEU:HD13	1:R:240:VAL:HG11	1.96	0.47
1:O:212:LYS:HE2	6:O:750:HOH:O	2.15	0.47
1:R:1:GLU:OE2	1:R:330:LYS:HE3	2.15	0.47
1:R:1(A):LYS:HA	1:R:1(A):LYS:HD2	1.68	0.47
1:R:149:OCS:OD3	2:R:401:NDP:H41N	2.15	0.47
1:O:80:LEU:HD23	1:O:80:LEU:HA	1.81	0.46
1:O:139:HIS:H	1:O:331:LYS:NZ	2.14	0.45
1:O:84:TRP:CE3	1:O:89:ILE:HG13	2.51	0.45
1:O:107:LYS:NZ	6:O:504:HOH:O	2.20	0.45
1:R:21:GLN:HA	1:R:21:GLN:OE1	2.16	0.45
1:O:9:GLY:HA3	2:O:401:NDP:O5B	2.17	0.45
1:R:170:GLY:HA3	1:R:244:VAL:HG12	1.99	0.44
1:O:222:LYS:NZ	6:O:521:HOH:O	2.46	0.44
1:O:6:ASN:OD1	1:O:31:ASN:ND2	2.45	0.44
1:O:88:ASN:ND2	6:O:503:HOH:O	2.18	0.44
1:R:249:LYS:HG2	1:R:302:ASP:HB3	1.99	0.44
1:O:82:LEU:HD13	1:O:84:TRP:CZ2	2.52	0.43
1:R:-5:HIS:ND1	1:R:-4:HIS:HD2	2.16	0.43
1:R:158:VAL:CG1	1:R:221:LEU:HD11	2.49	0.43
1:O:193:LEU:CD1	1:R:38:LYS:HE2	2.48	0.43
1:R:-2:HIS:CD2	1:R:-2:HIS:N	2.87	0.43
1:R:324:LEU:O	1:R:328:THR:HG23	2.19	0.43
1:R:11:ILE:HD11	2:R:401:NDP:H42N	1.99	0.43
1:O:83:PRO:O	1:O:87:MET:HG3	2.20	0.42
1:O:9:GLY:O	1:O:13:ARG:HG3	2.20	0.42
1:O:154:LEU:HD23	1:O:214:VAL:CG2	2.50	0.42
1:O:11:ILE:HD11	2:O:401:NDP:H42N	2.01	0.41
1:R:191:ARG:HA	1:R:191:ARG:HD2	1.83	0.41
1:R:248:LYS:HE2	6:R:714:HOH:O	2.19	0.41
1:O:193:LEU:HD11	1:R:38:LYS:HE2	2.01	0.41
1:O:164:LYS:HA	1:O:164:LYS:HD2	1.74	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:O:187:ALA:O	1:O:196:ALA:HB1	2.21	0.41
1:O:87:MET:HE3	1:O:87:MET:HB3	1.95	0.41
1:R:187:ALA:O	1:R:196:ALA:HB1	2.21	0.41

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)
6:O:780:HOH:O	6:O:780:HOH:O[6_555]	2.18	0.02

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	O	338/348 (97%)	327 (97%)	10 (3%)	1 (0%)	41	24
1	R	345/348 (99%)	330 (96%)	14 (4%)	1 (0%)	41	24
All	All	683/696 (98%)	657 (96%)	24 (4%)	2 (0%)	41	24

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	O	237	VAL
1	R	237	VAL

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	O	284/290 (98%)	277 (98%)	7 (2%)	47	29
1	R	291/290 (100%)	279 (96%)	12 (4%)	30	12
All	All	575/580 (99%)	556 (97%)	19 (3%)	38	19

All (19) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	O	10	ARG
1	O	21	GLN
1	O	39	GLN
1	O	77	ARG
1	O	78	ASP
1	O	94	GLU
1	O	169	LYS
1	R	0	MET
1	R	21	GLN
1	R	61	ASP
1	R	72	LYS
1	R	77	ARG
1	R	86	GLU
1	R	94	GLU
1	R	102	LYS
1	R	123	LYS
1	R	169	LYS
1	R	172	MET
1	R	330	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (3) such sidechains are listed below:

Mol	Chain	Res	Type
1	O	139	HIS
1	R	-4	HIS
1	R	-2	HIS

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

2 non-standard protein/DNA/RNA residues 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
1	OCS	O	149	1	7,8,9	1.01	0	6,11,13	1.95	3 (50%)
1	OCS	R	149	1	7,8,9	1.00	0	6,11,13	1.89	3 (50%)

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
1	OCS	O	149	1	-	0/4/7/9	-
1	OCS	R	149	1	-	0/4/7/9	-

There are no bond length outliers.

All (6) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	O	149	OCS	OD2-SG-CB	2.61	109.89	105.74
1	O	149	OCS	OD1-SG-CB	2.59	110.01	106.94
1	R	149	OCS	OD2-SG-CB	2.57	109.83	105.74
1	R	149	OCS	OD3-SG-CB	2.54	109.96	106.94
1	O	149	OCS	OD3-SG-CB	2.35	109.74	106.94
1	R	149	OCS	OD1-SG-CB	2.21	109.56	106.94

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

2 monomers are involved in 3 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
1	O	149	OCS	1	0
1	R	149	OCS	2	0

5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

5.6 Ligand geometry [i](#)

11 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
4	EDO	O	406	-	3,3,3	0.44	0	2,2,2	0.36	0
3	SO4	R	403	-	4,4,4	0.14	0	6,6,6	0.05	0
3	SO4	O	403	-	4,4,4	0.13	0	6,6,6	0.06	0
3	SO4	R	402	-	4,4,4	0.14	0	6,6,6	0.05	0
5	GOL	R	405	-	5,5,5	0.93	0	5,5,5	1.12	0
3	SO4	R	404	-	4,4,4	0.14	0	6,6,6	0.06	0
3	SO4	O	404	-	4,4,4	0.15	0	6,6,6	0.05	0
3	SO4	O	402	-	4,4,4	0.14	0	6,6,6	0.05	0
2	NDP	O	401	-	45,52,52	2.32	4 (8%)	53,80,80	1.70	11 (20%)
2	NDP	R	401	-	45,52,52	2.34	4 (8%)	53,80,80	1.69	10 (18%)
3	SO4	O	405	-	4,4,4	0.16	0	6,6,6	0.10	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
2	NDP	O	401	-	-	8/30/77/77	0/5/5/5
2	NDP	R	401	-	-	7/30/77/77	0/5/5/5
4	EDO	O	406	-	-	0/1/1/1	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
5	GOL	R	405	-	-	1/4/4/4	-

All (8) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	R	401	NDP	P2B-O2B	13.21	1.84	1.59
2	O	401	NDP	P2B-O2B	13.09	1.84	1.59
2	O	401	NDP	PN-O5D	3.97	1.75	1.59
2	R	401	NDP	PN-O5D	3.94	1.75	1.59
2	O	401	NDP	O2B-C2B	-2.92	1.33	1.44
2	R	401	NDP	O2B-C2B	-2.88	1.33	1.44
2	R	401	NDP	C2A-N1A	2.27	1.38	1.33
2	O	401	NDP	C2A-N1A	2.22	1.38	1.33

All (21) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	O	401	NDP	PN-O3-PA	-6.83	109.40	132.83
2	R	401	NDP	PN-O3-PA	-6.62	110.09	132.83
2	R	401	NDP	O2B-P2B-O1X	-3.38	96.36	109.39
2	O	401	NDP	O2B-P2B-O1X	-3.31	96.62	109.39
2	R	401	NDP	PA-O5B-C5B	-2.99	104.16	121.68
2	O	401	NDP	PA-O5B-C5B	-2.91	104.60	121.68
2	O	401	NDP	C3N-C2N-N1N	-2.86	119.01	123.10
2	R	401	NDP	O5D-PN-O1N	-2.80	98.12	109.07
2	O	401	NDP	O5D-PN-O1N	-2.67	98.65	109.07
2	R	401	NDP	C3N-C2N-N1N	-2.63	119.35	123.10
2	O	401	NDP	O3X-P2B-O2X	2.53	117.31	107.64
2	R	401	NDP	O3X-P2B-O2X	2.52	117.25	107.64
2	O	401	NDP	O4B-C4B-C3B	2.49	110.04	105.11
2	R	401	NDP	O4B-C4B-C3B	2.49	110.03	105.11
2	R	401	NDP	C2A-N1A-C6A	-2.32	114.79	118.75
2	O	401	NDP	C2A-N1A-C6A	-2.27	114.87	118.75
2	R	401	NDP	O2N-PN-O1N	2.26	123.39	112.24
2	O	401	NDP	C5B-C4B-C3B	-2.25	106.73	115.18
2	O	401	NDP	O2N-PN-O1N	2.22	123.22	112.24
2	R	401	NDP	C5B-C4B-C3B	-2.14	107.15	115.18
2	O	401	NDP	PN-O5D-C5D	-2.06	109.59	121.68

There are no chirality outliers.

All (16) torsion outliers are listed below:

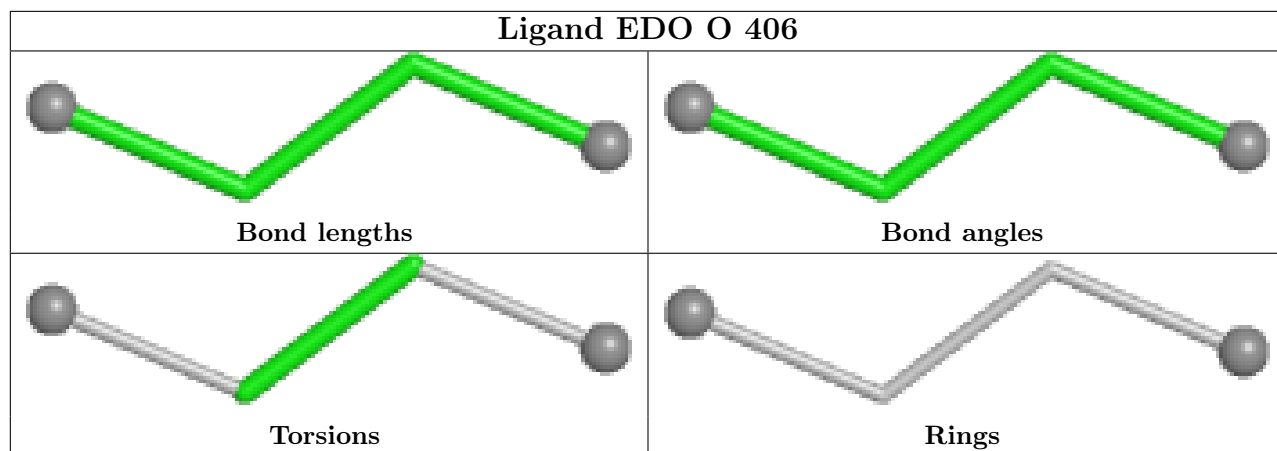
Mol	Chain	Res	Type	Atoms
2	O	401	NDP	C5B-O5B-PA-O1A
2	O	401	NDP	C2B-O2B-P2B-O3X
2	R	401	NDP	C5B-O5B-PA-O1A
2	O	401	NDP	O4B-C4B-C5B-O5B
2	O	401	NDP	C3B-C4B-C5B-O5B
2	R	401	NDP	O4B-C4B-C5B-O5B
2	R	401	NDP	C3B-C4B-C5B-O5B
2	O	401	NDP	C5B-O5B-PA-O3
2	R	401	NDP	C5B-O5B-PA-O3
2	R	401	NDP	C5B-O5B-PA-O2A
2	R	401	NDP	O4D-C1D-N1N-C6N
5	R	405	GOL	O1-C1-C2-C3
2	O	401	NDP	O4D-C1D-N1N-C6N
2	R	401	NDP	C2D-C1D-N1N-C6N
2	O	401	NDP	C2D-C1D-N1N-C6N
2	O	401	NDP	C5B-O5B-PA-O2A

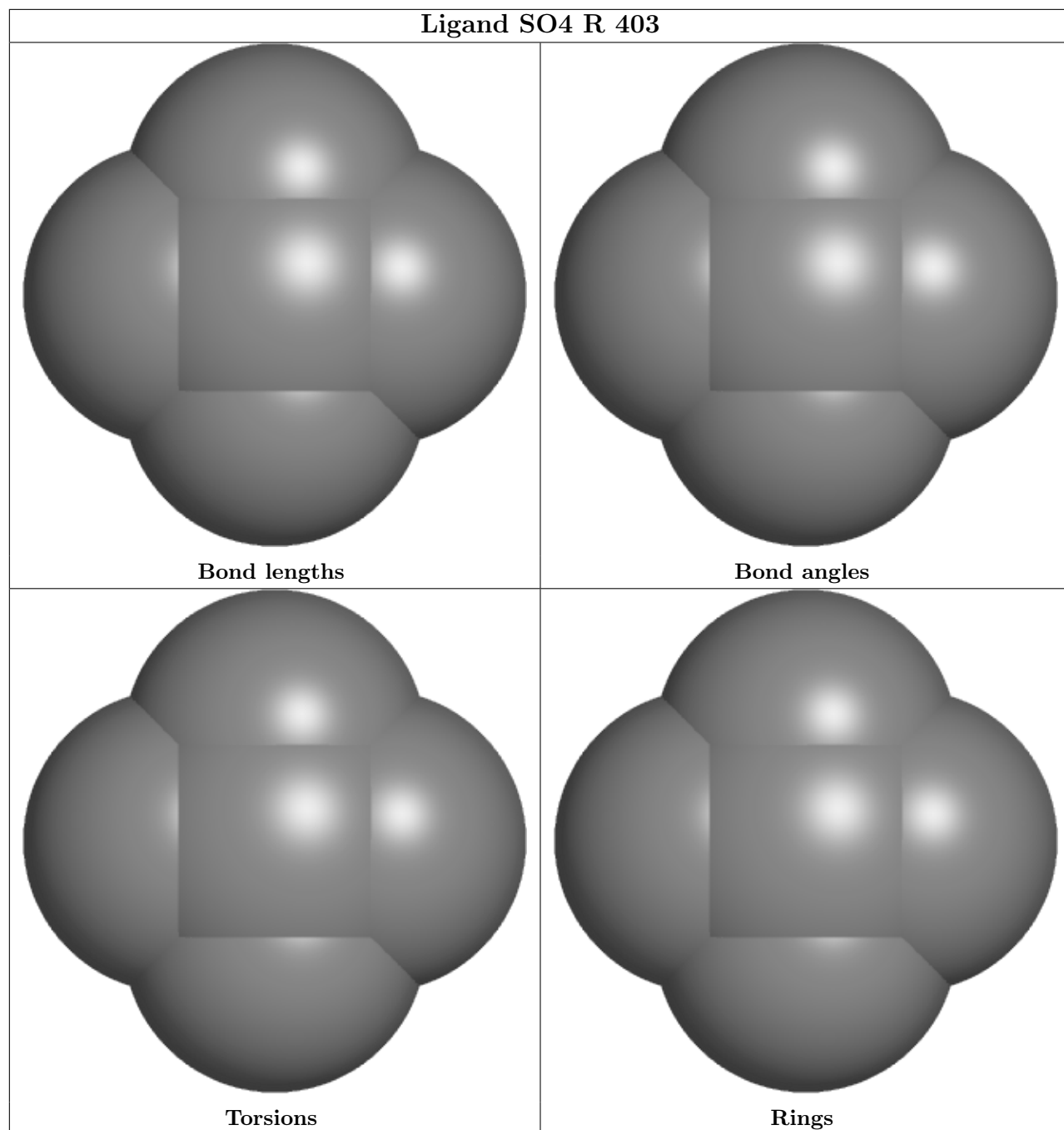
There are no ring outliers.

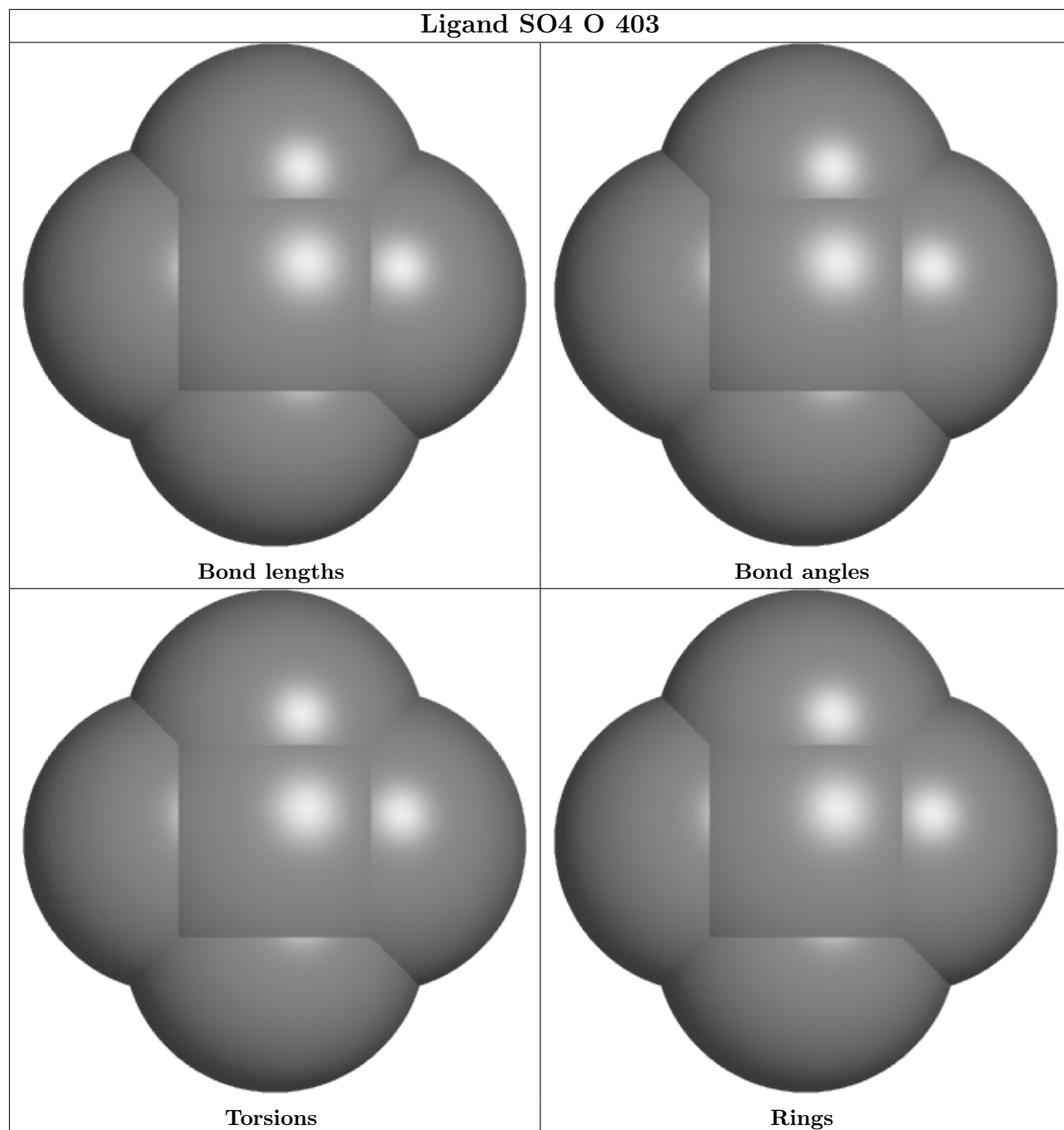
4 monomers are involved in 8 short contacts:

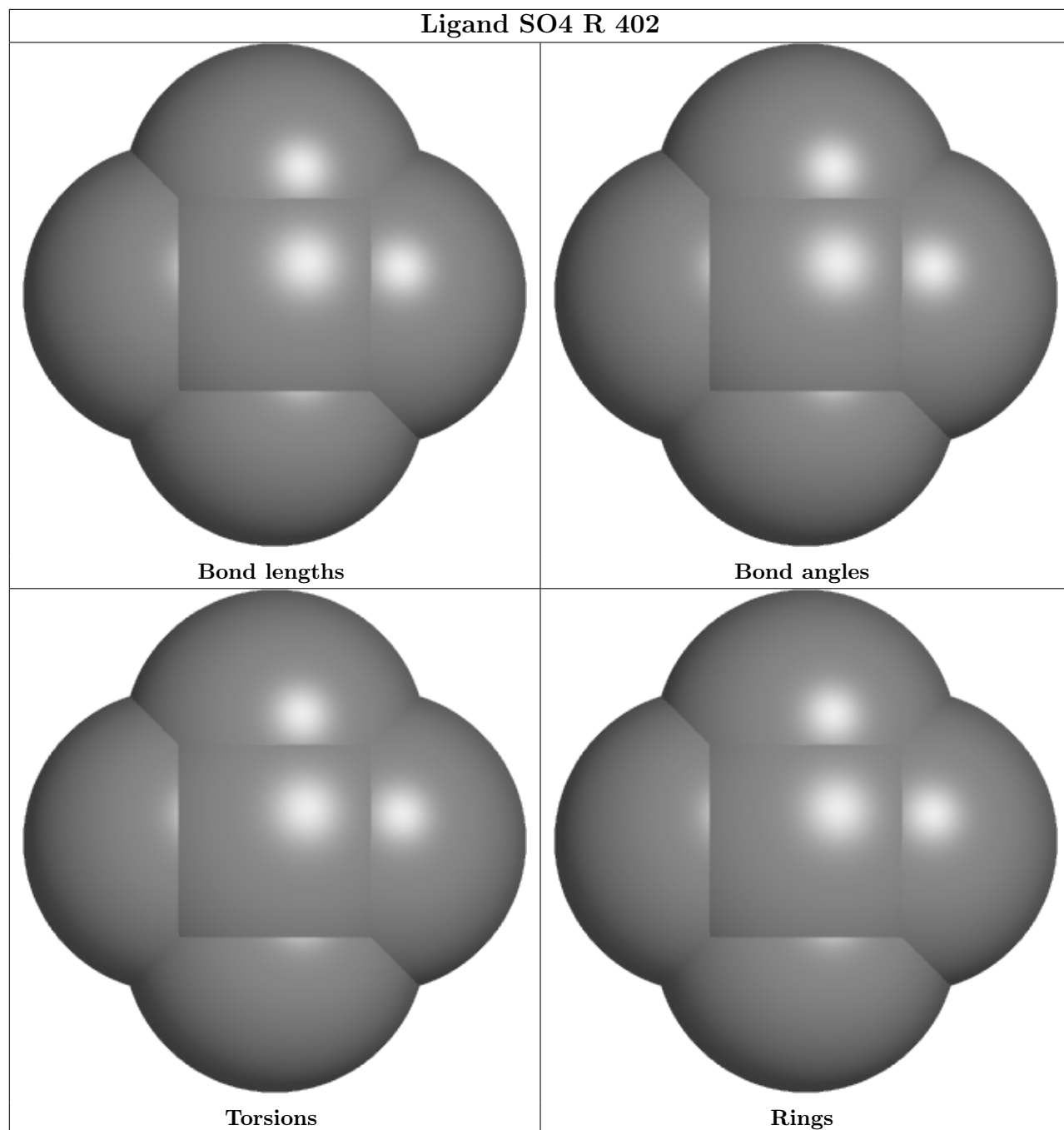
Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	R	405	GOL	1	0
2	O	401	NDP	4	0
2	R	401	NDP	2	0
3	O	405	SO4	1	0

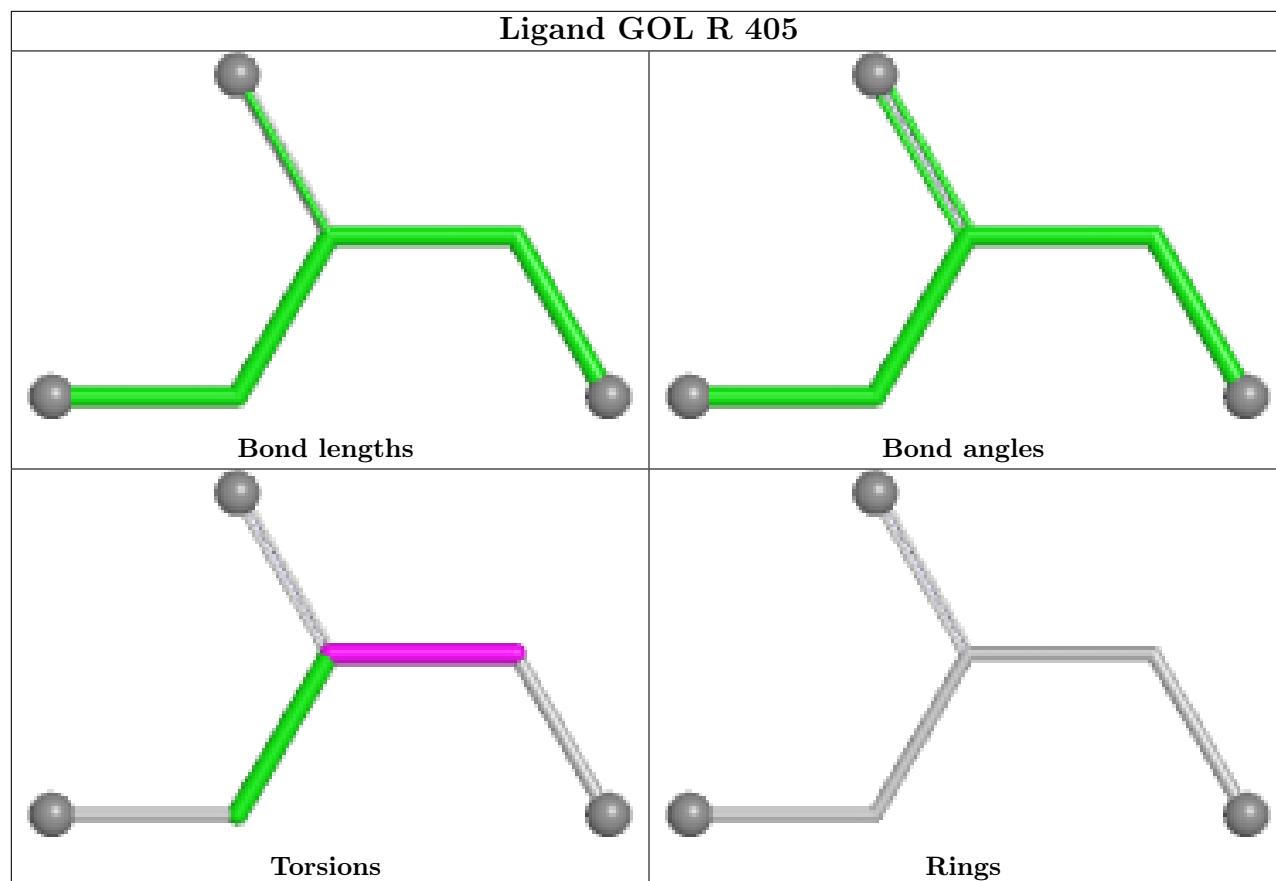
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included.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

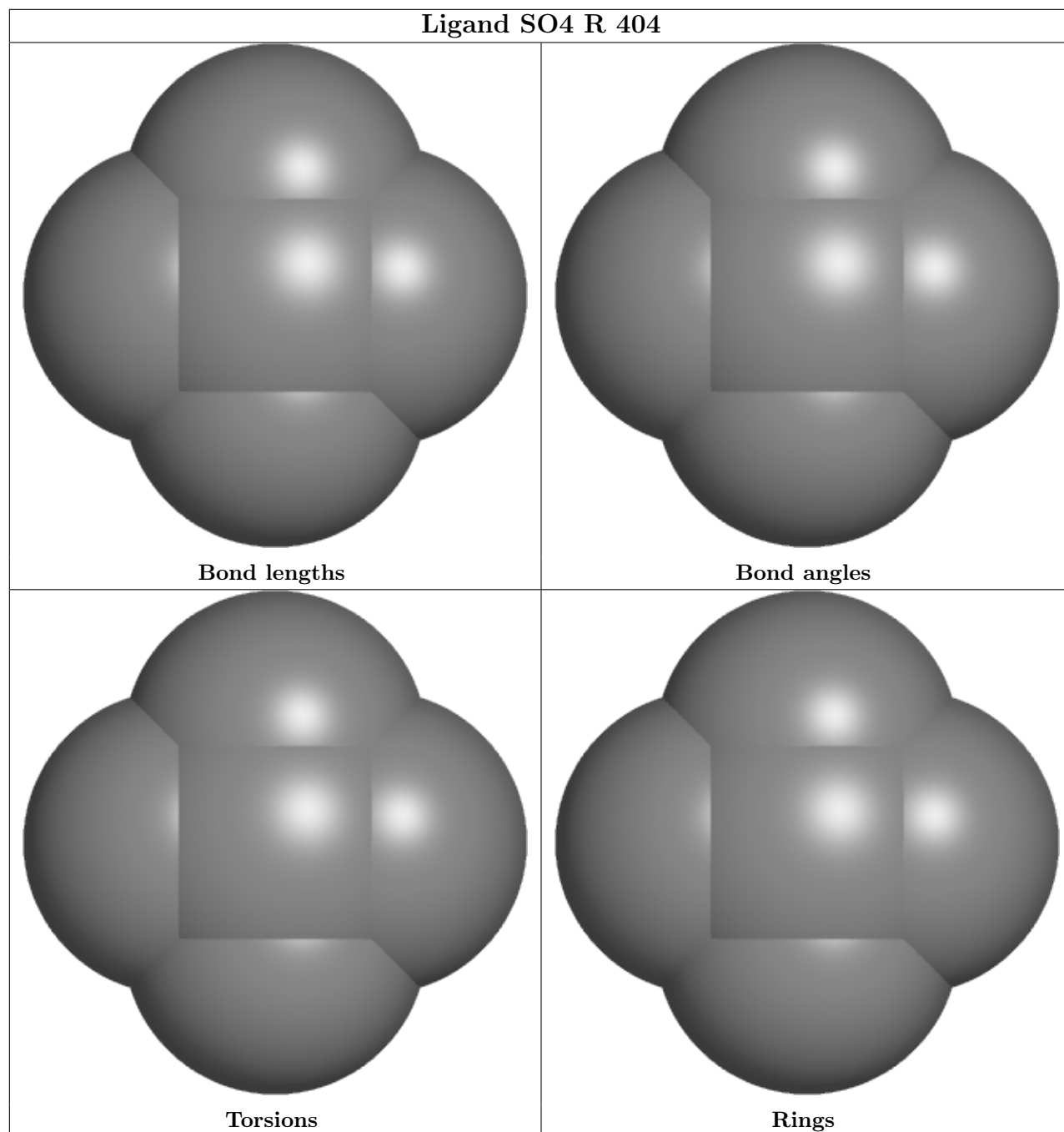


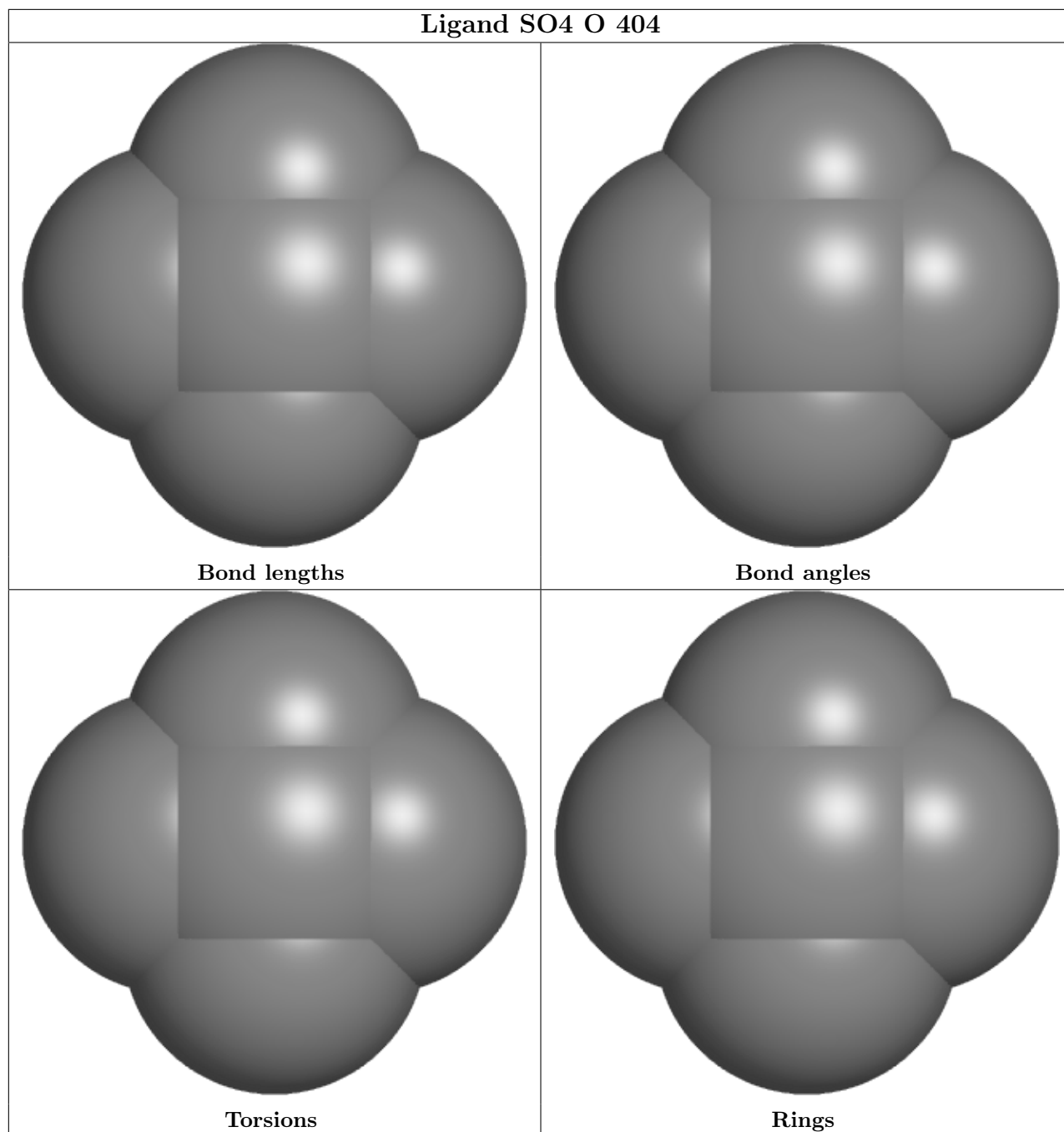


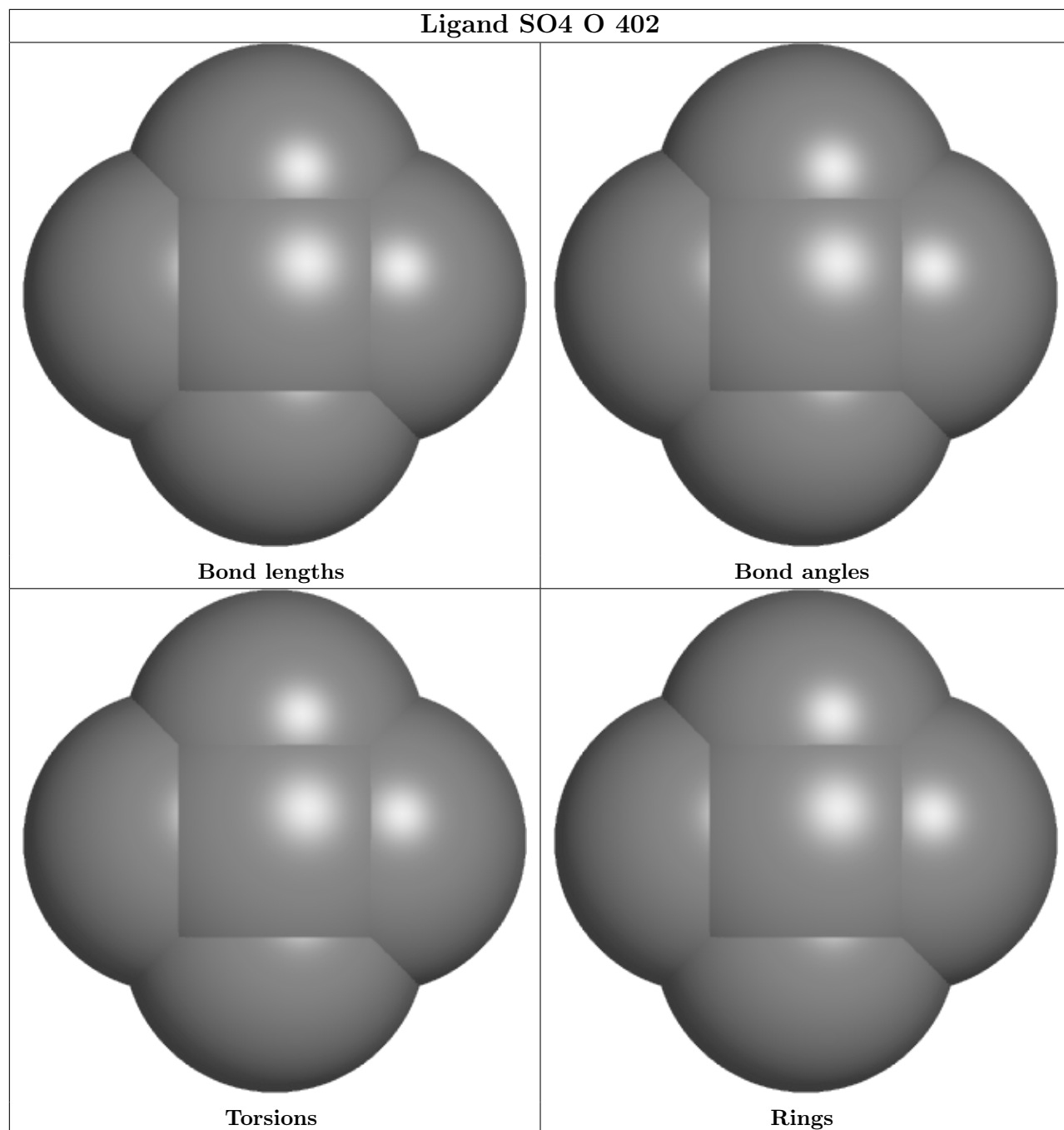


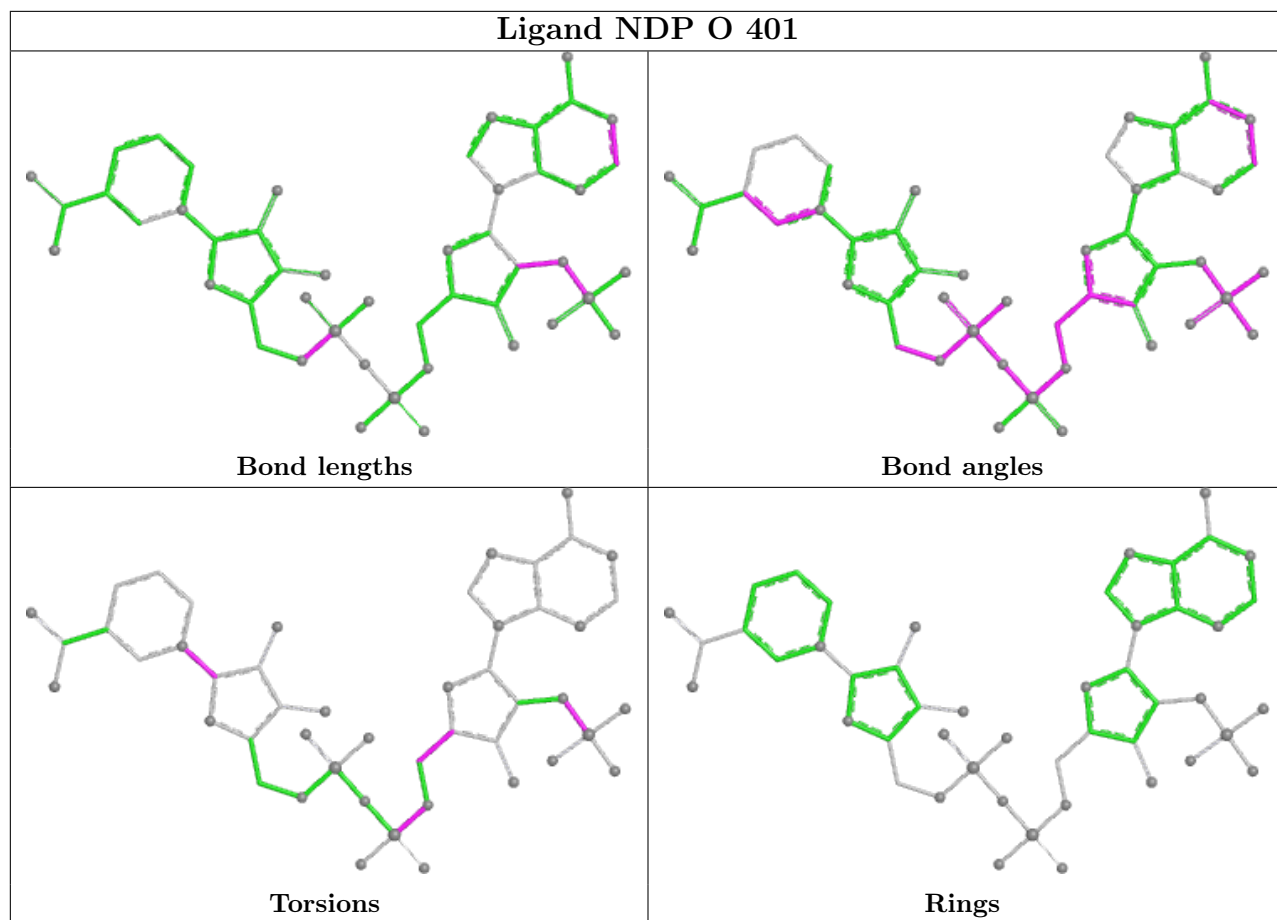


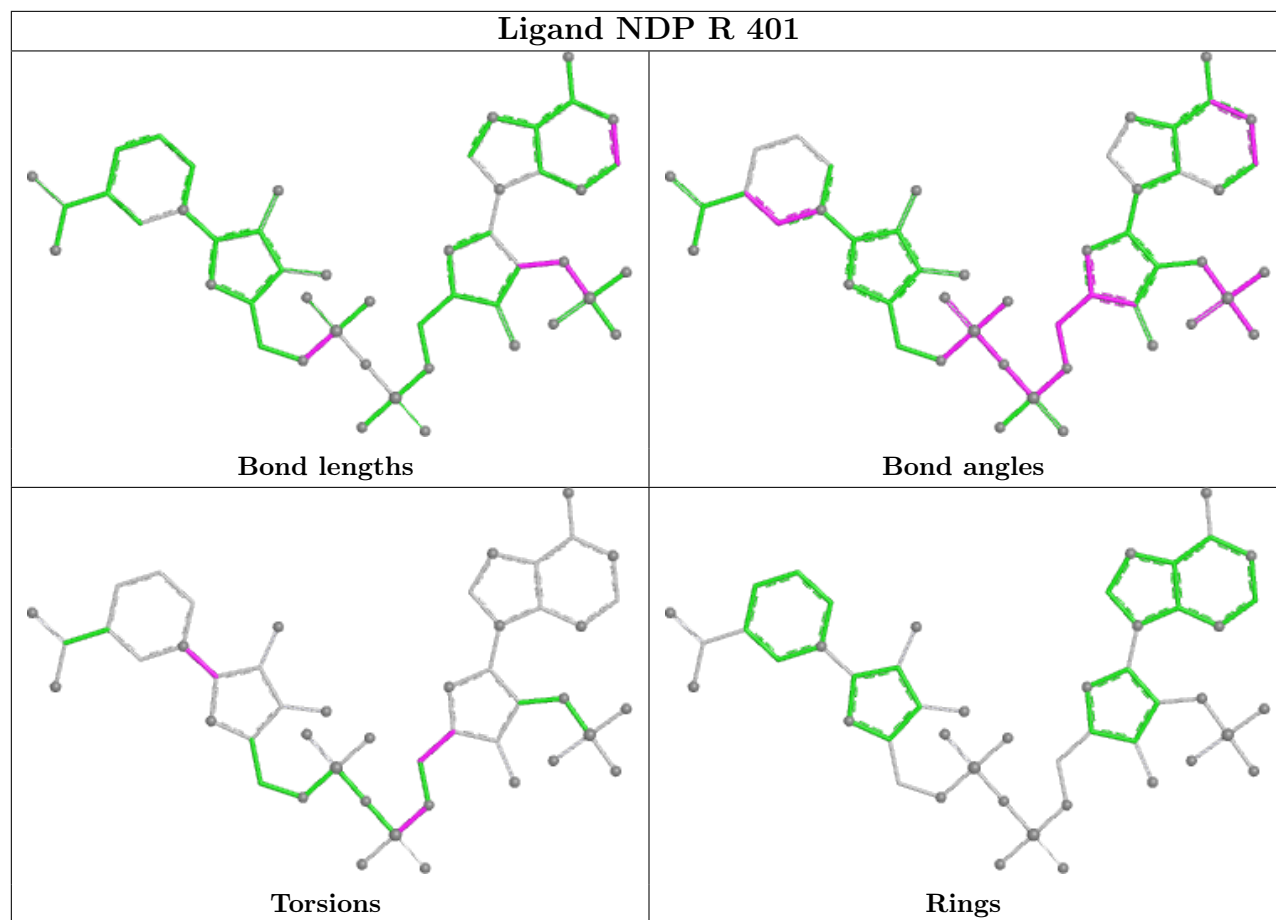


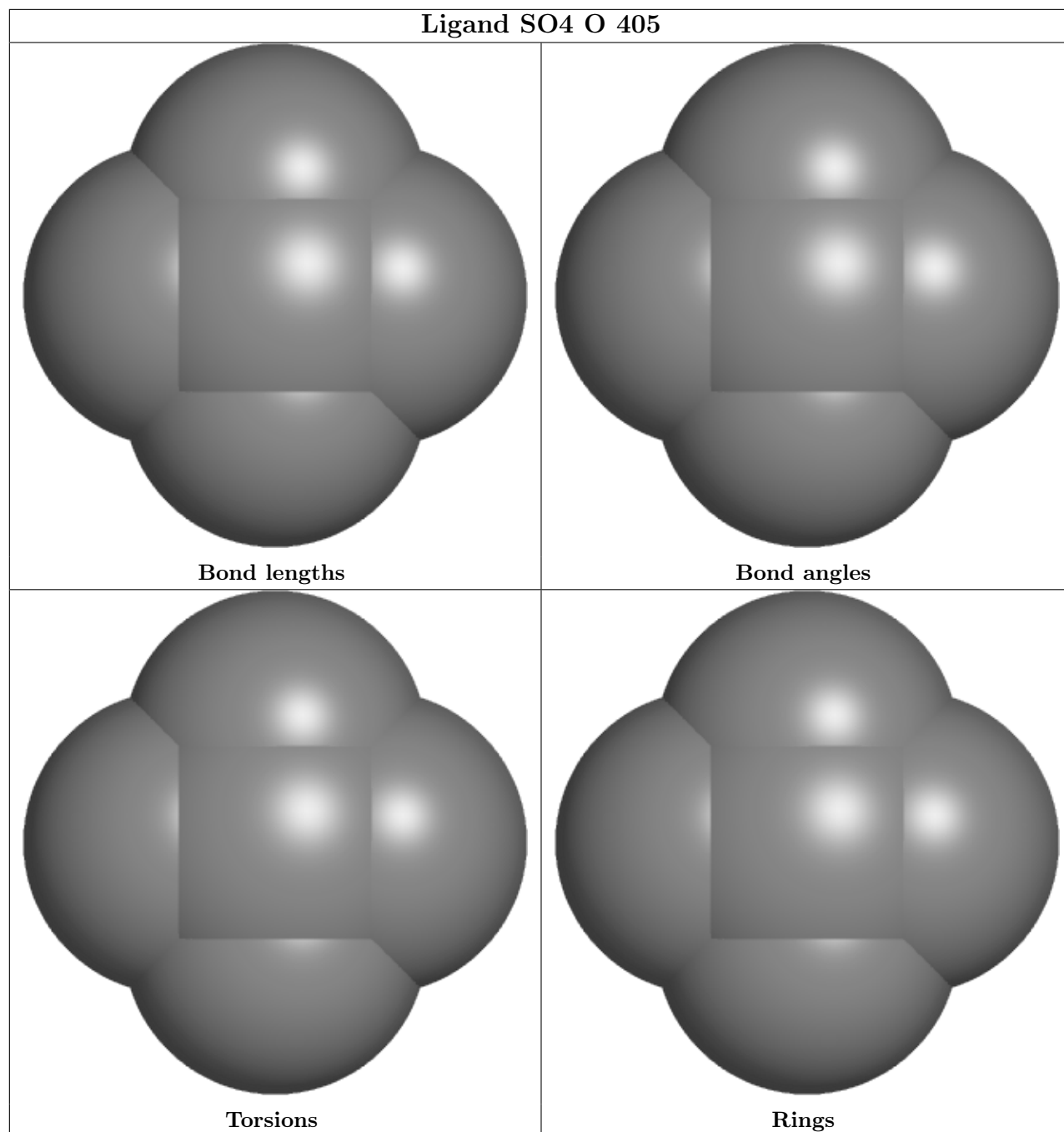












5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data [i](#)

6.1 Protein, DNA and RNA chains [i](#)

In the following table, the column labelled ‘#RSRZ > 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 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	O	337/348 (96%)	0.11	11 (3%) 46 51	16, 27, 52, 62	0
1	R	345/348 (99%)	0.06	7 (2%) 65 69	16, 27, 49, 67	0
All	All	682/696 (97%)	0.08	18 (2%) 56 60	16, 27, 50, 67	0

All (18) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	R	-6	HIS	4.6
1	R	-1	HIS	4.6
1	O	88	ASN	3.7
1	R	1	GLU	2.5
1	R	0	MET	2.5
1	O	101	ASP	2.4
1	R	88	ASN	2.3
1	R	-2	HIS	2.3
1	O	75	SER	2.3
1	O	110	GLN	2.2
1	O	103	VAL	2.2
1	O	100	ILE	2.2
1	O	98	VAL	2.2
1	O	33	SER	2.1
1	O	84	TRP	2.1
1	R	109	ILE	2.1
1	O	32	ASP	2.0
1	O	109	ILE	2.0

6.2 Non-standard residues in protein, DNA, RNA chains [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(\AA^2)	Q<0.9
1	OCS	R	149	9/10	0.97	0.08	23,24,29,37	1
1	OCS	O	149	9/10	0.98	0.07	20,24,28,38	2

6.3 Carbohydrates [i](#)

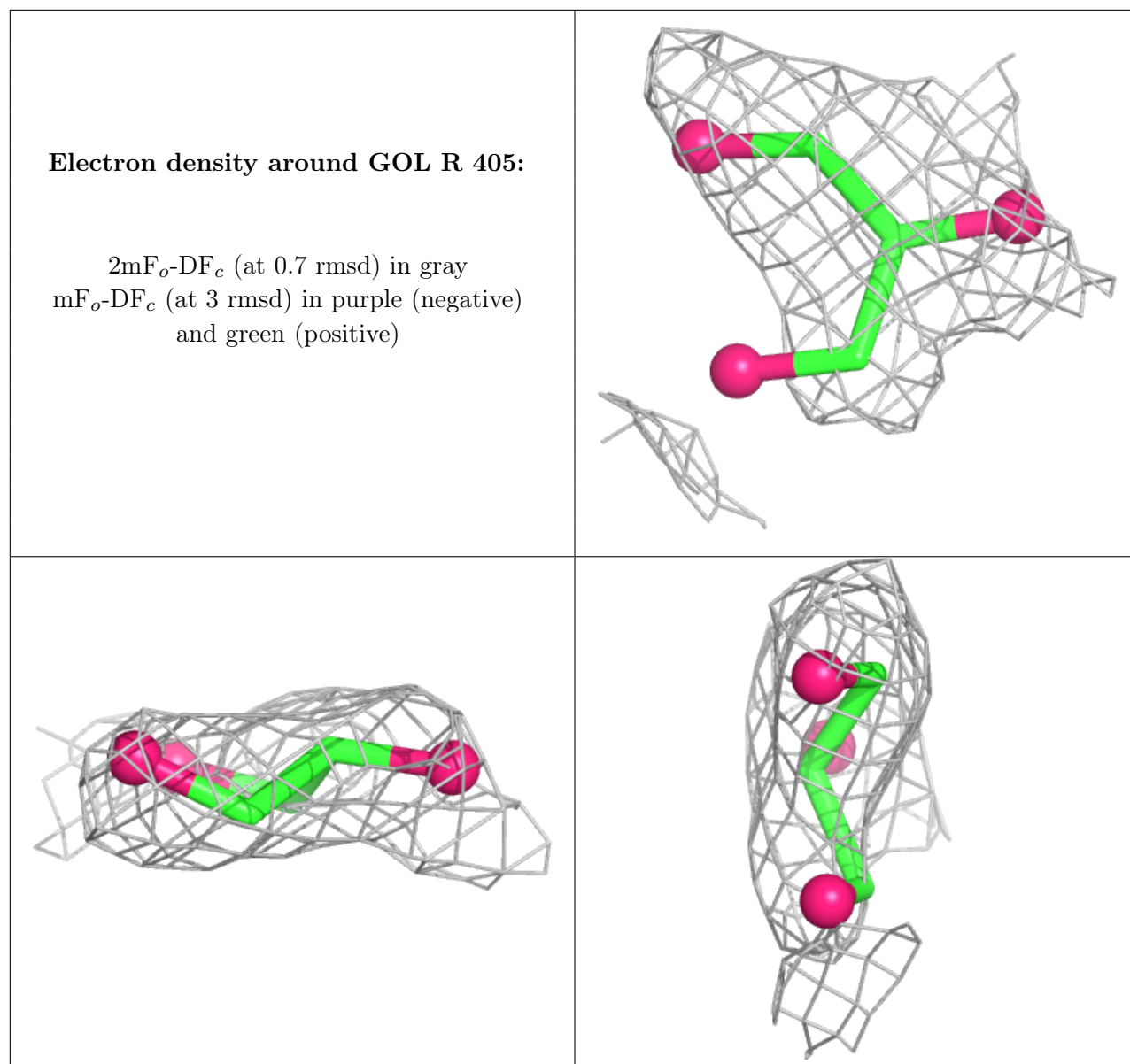
There are no monosaccharides in this entry.

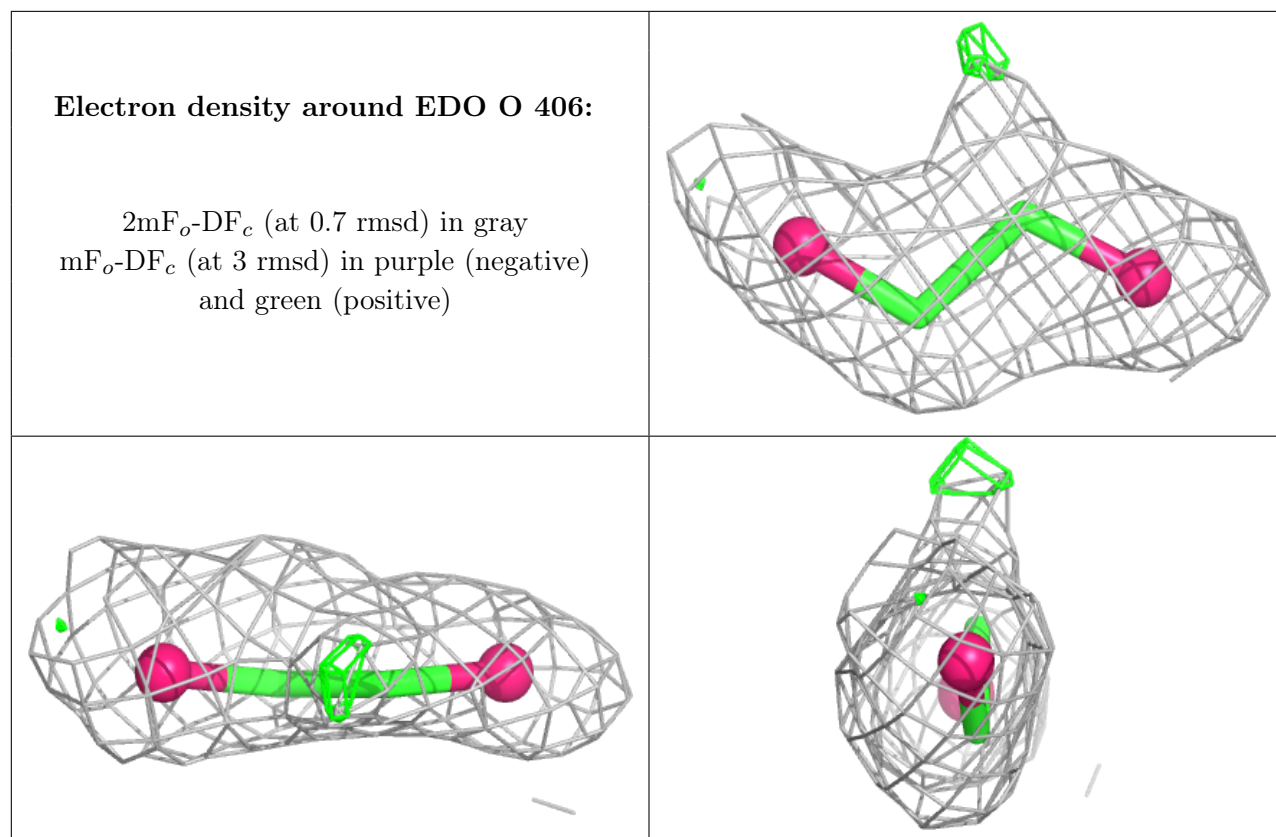
6.4 Ligands [i](#)

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, 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(\AA^2)	Q<0.9
5	GOL	R	405	6/6	0.72	0.34	48,52,69,73	0
4	EDO	O	406	4/4	0.74	0.15	41,44,47,52	0
3	SO4	O	405	5/5	0.86	0.20	33,41,50,51	5
2	NDP	R	401	48/48	0.87	0.14	23,30,51,55	48
2	NDP	O	401	48/48	0.90	0.12	23,33,50,57	48
3	SO4	R	403	5/5	0.94	0.09	36,36,38,43	5
3	SO4	O	403	5/5	0.95	0.10	31,36,41,42	5
3	SO4	O	402	5/5	0.96	0.10	43,46,51,53	5
3	SO4	R	402	5/5	0.97	0.14	41,41,44,45	5
3	SO4	O	404	5/5	0.98	0.11	31,32,38,41	5
3	SO4	R	404	5/5	0.98	0.11	30,31,38,40	5

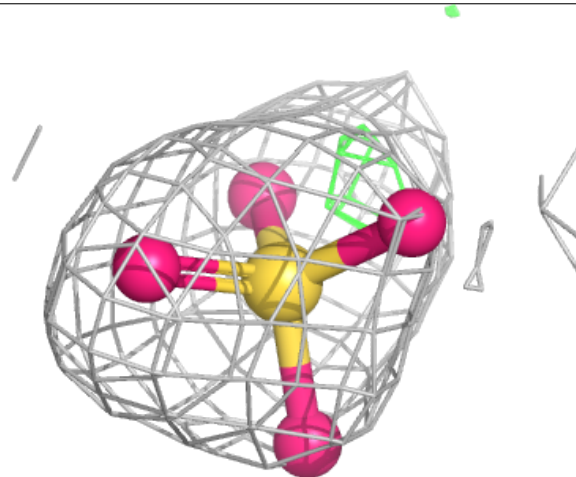
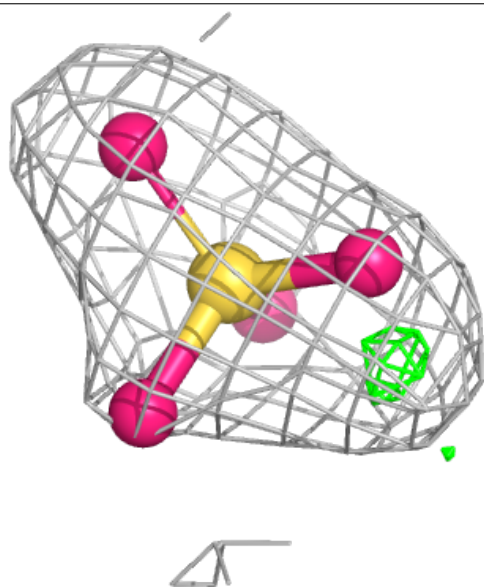
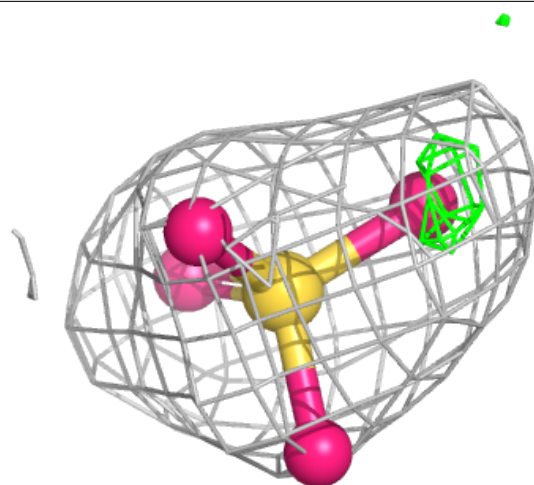
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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





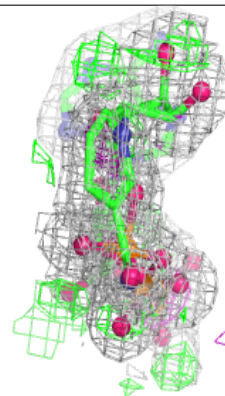
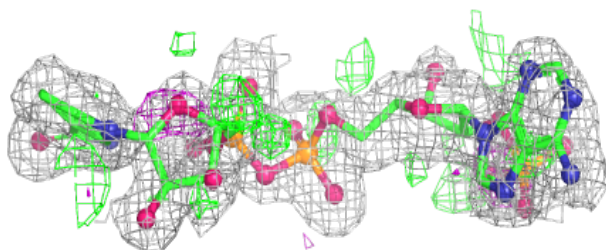
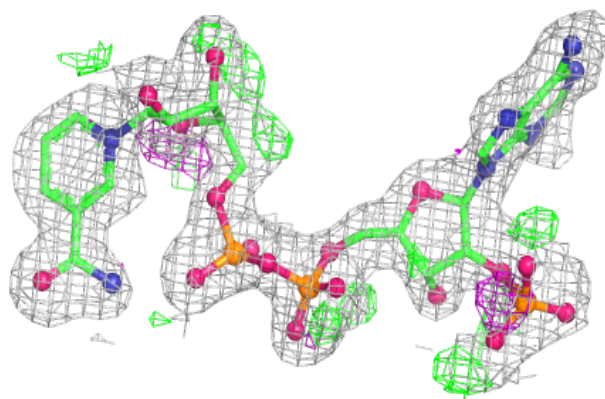
Electron density around SO4 O 405:

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

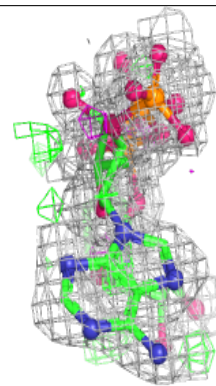
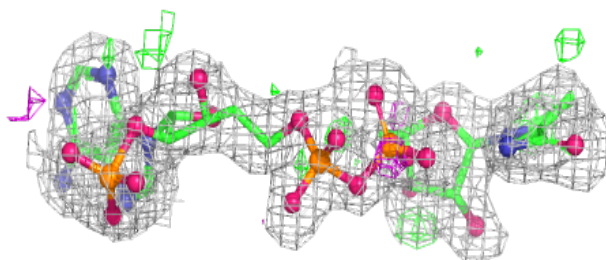
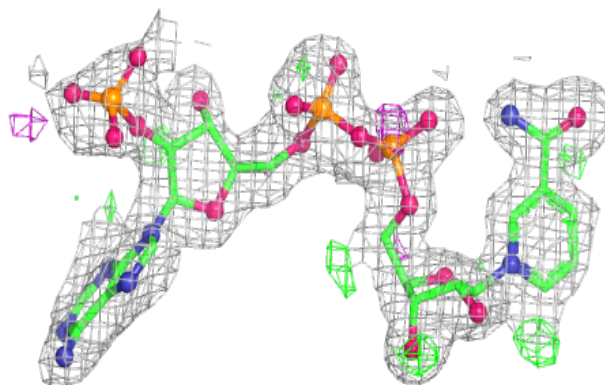


Electron density around NDP R 401:

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

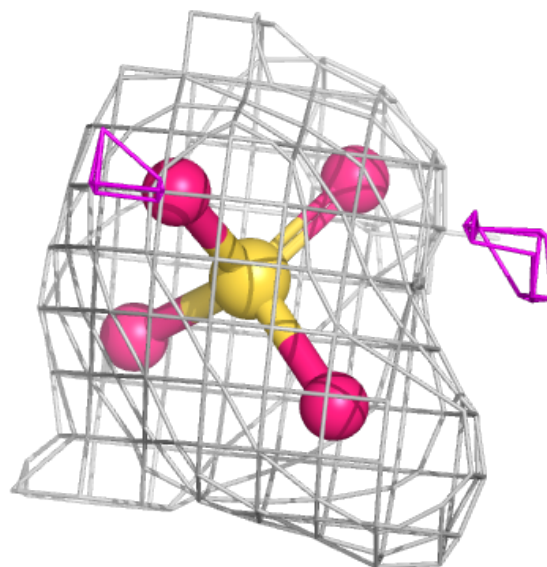
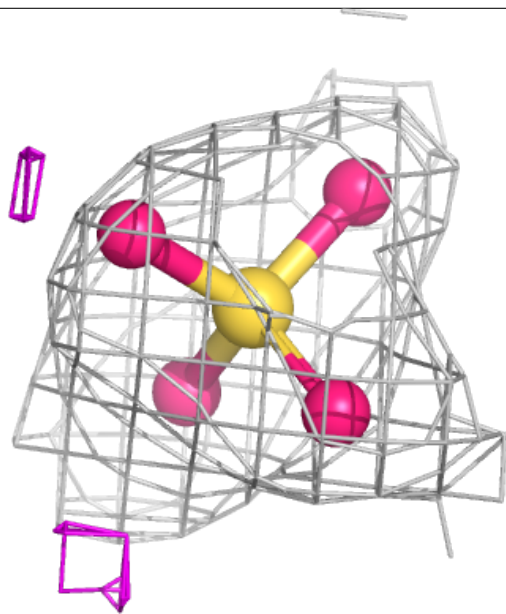
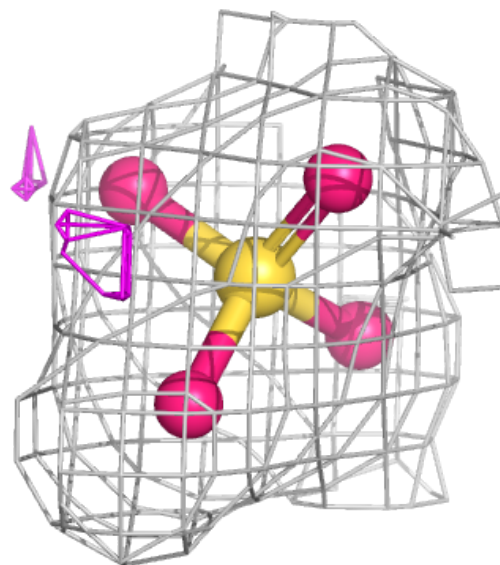
**Electron density around NDP O 401:**

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



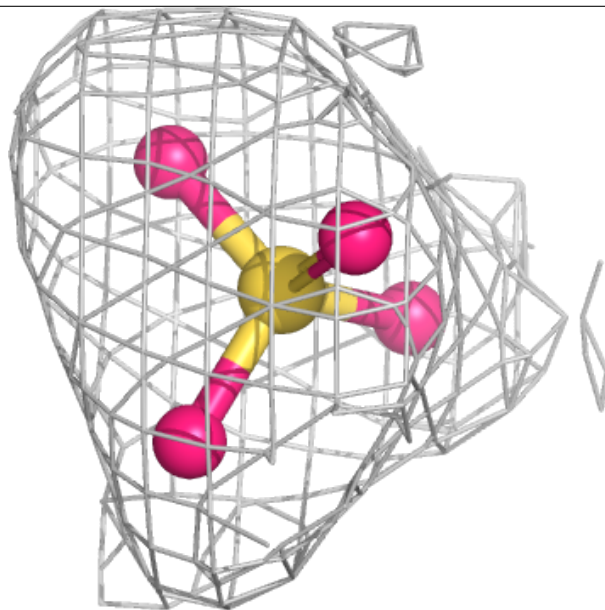
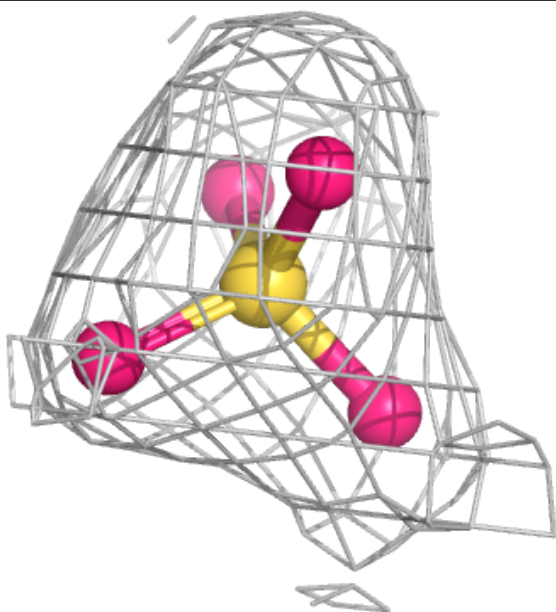
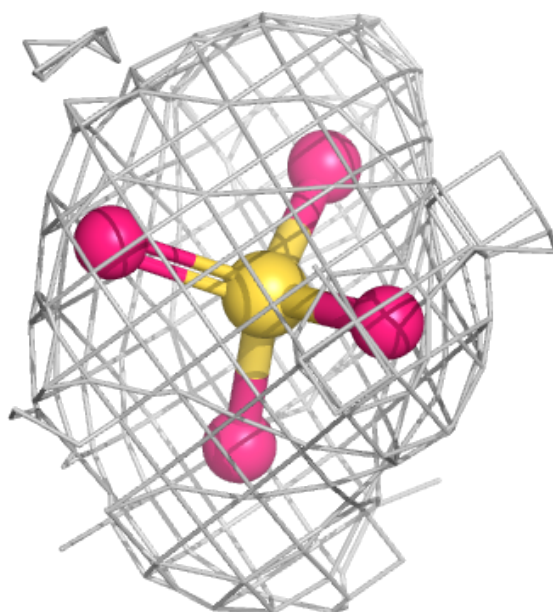
Electron density around SO4 R 403:

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



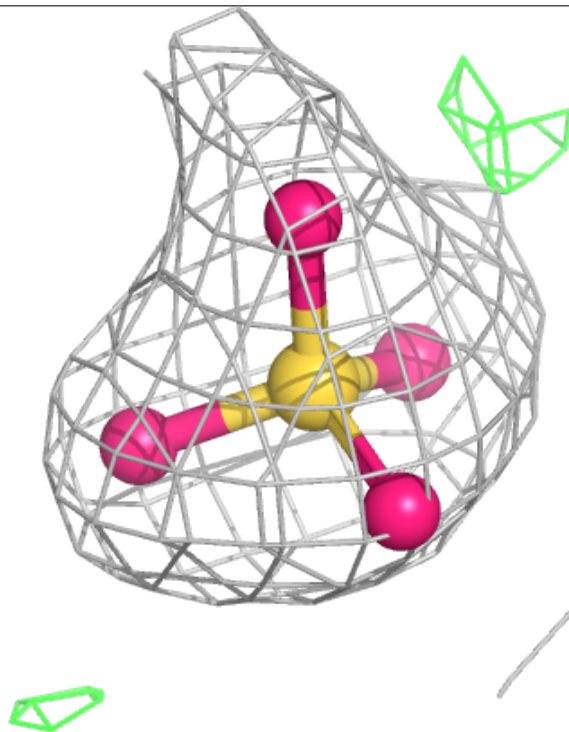
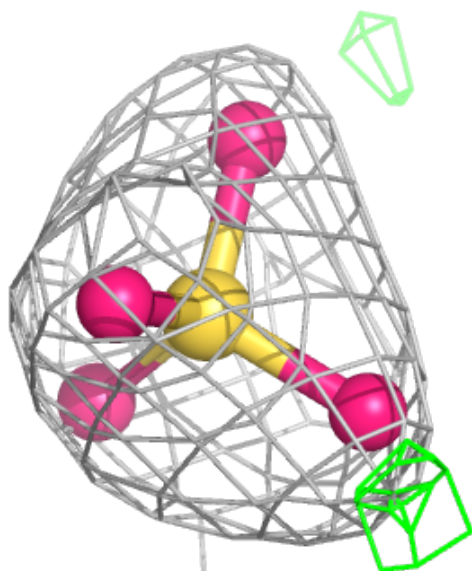
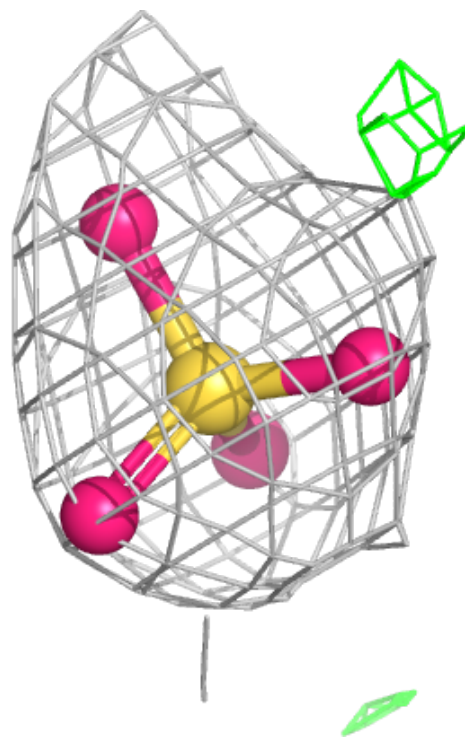
Electron density around SO4 O 403:

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



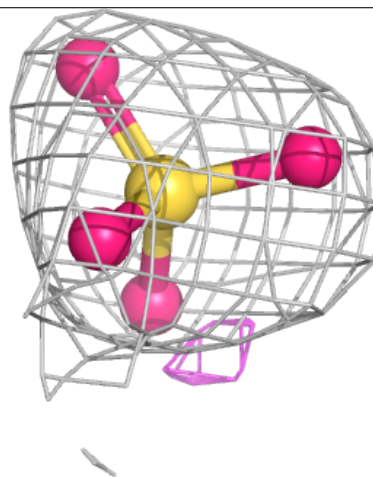
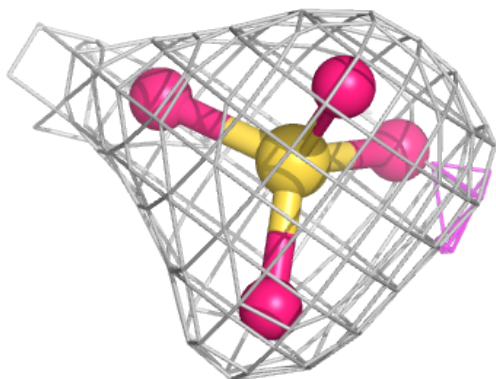
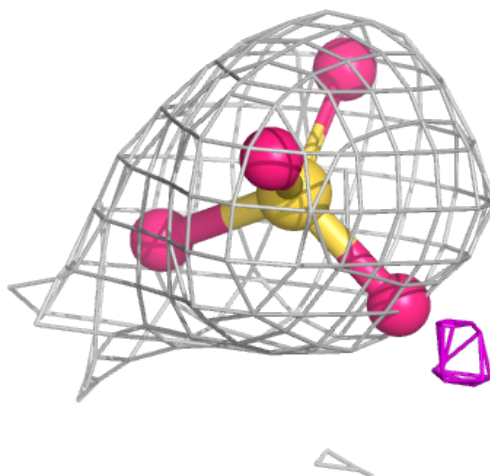
Electron density around SO4 O 402:

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and green (positive)



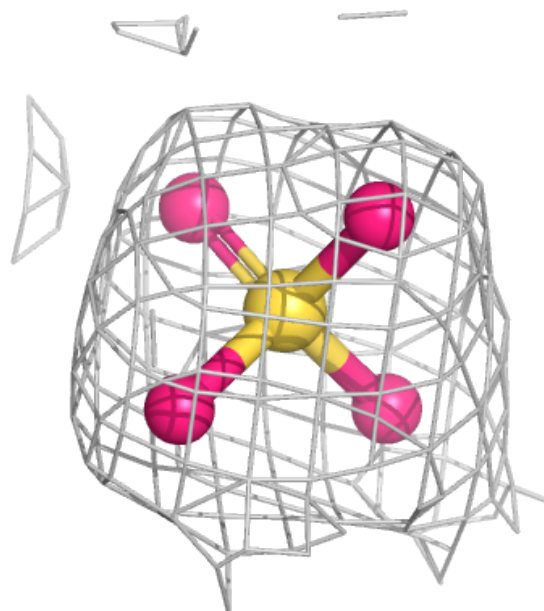
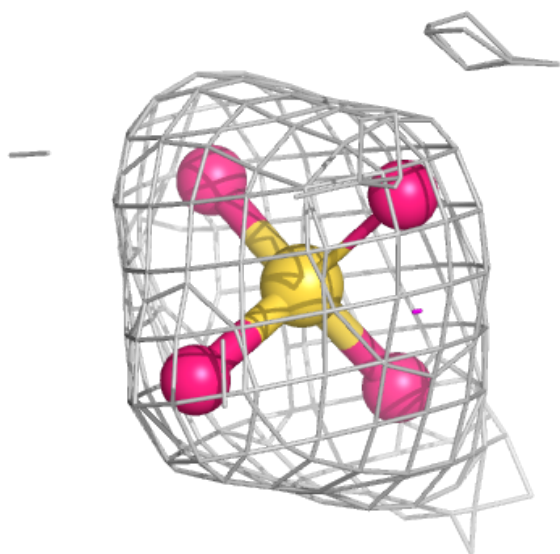
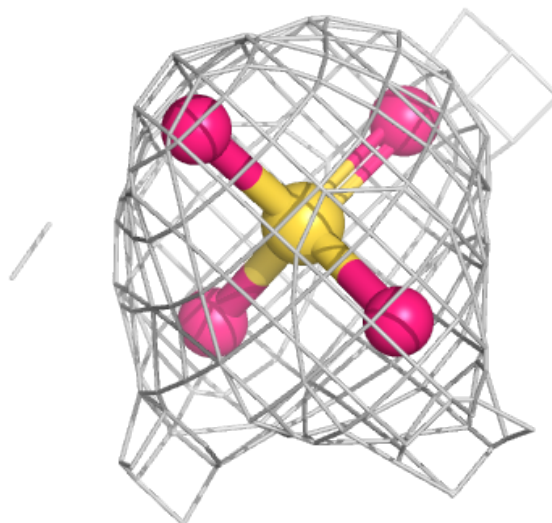
Electron density around SO4 R 402:

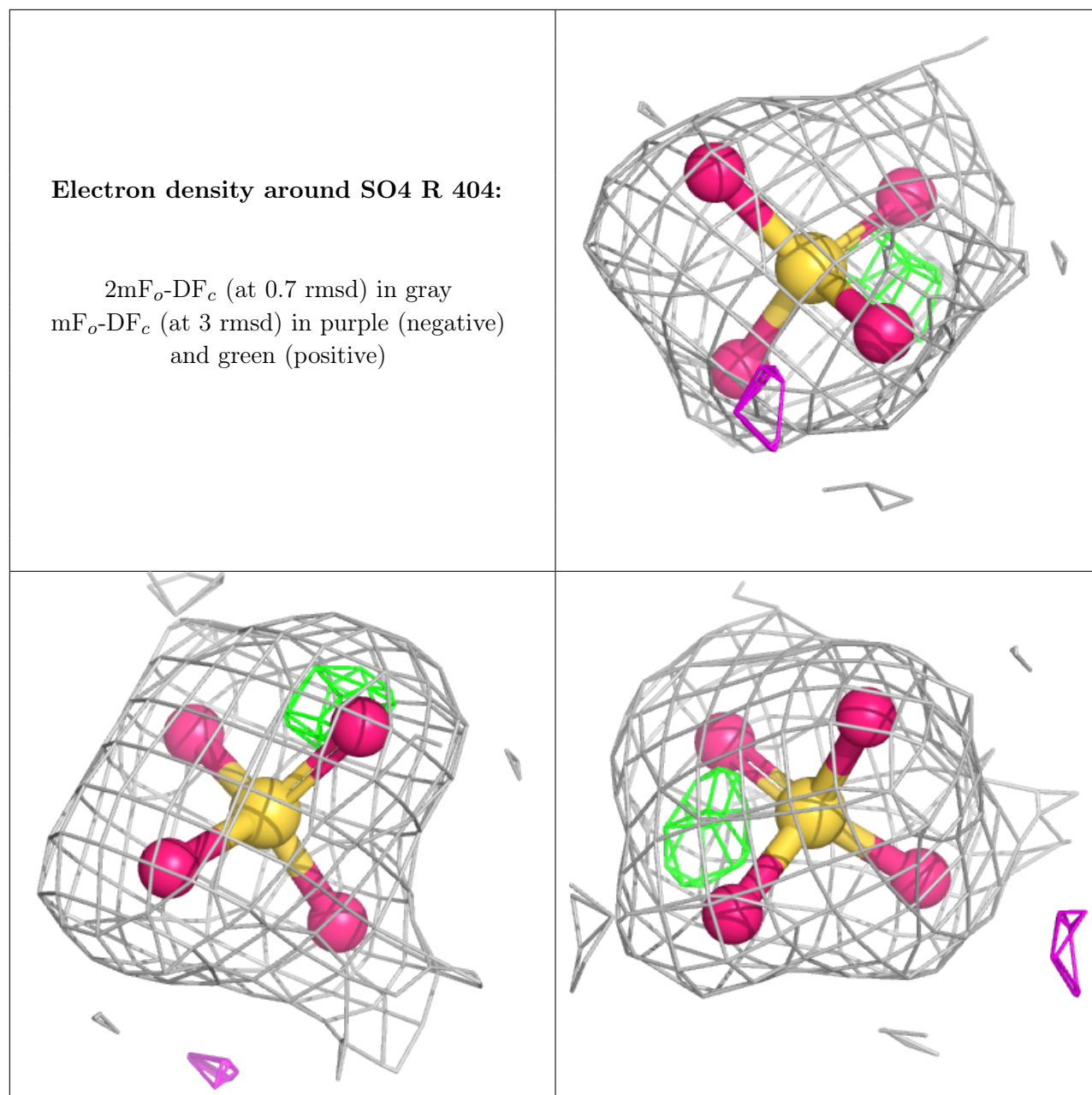
$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



Electron density around SO4 O 404:

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





6.5 Other polymers ⓘ

There are no such residues in this entry.