



Full wwPDB X-ray Structure Validation Report ⓘ

Jul 17, 2024 – 01:41 pm BST

PDB ID : 8OQO
Title : Structure of Mycobacterium tuberculosis beta-oxidation trifunctional enzyme in complex with Fragment-M-49
Authors : Dalwani, S.; Wierenga, R.K.; Venkatesan, R.
Deposited on : 2023-04-12
Resolution : 2.60 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

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 : 2.37.1
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) : 2.37.1

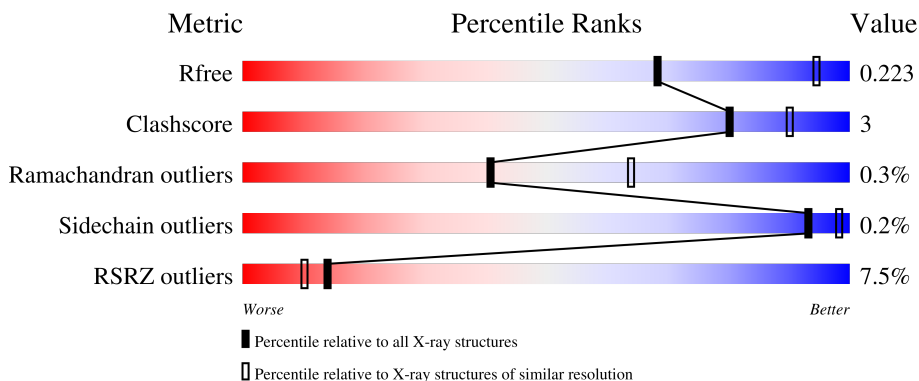
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.60 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	3163 (2.60-2.60)
Clashscore	141614	3518 (2.60-2.60)
Ramachandran outliers	138981	3455 (2.60-2.60)
Sidechain outliers	138945	3455 (2.60-2.60)
RSRZ outliers	127900	3104 (2.60-2.60)

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 ≥ 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	736	 19% 90% 8%
1	B	736	 % 94% 5%
2	C	403	 2% 90% 8%
2	D	403	 3% 89% 8%

2 Entry composition [i](#)

There are 6 unique types of molecules in this entry. The entry contains 17006 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 Probable fatty oxidation protein FadB.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	727	Total	C	N	O	S	0	0	0
			5421	3428	934	1038	21			
1	B	726	Total	C	N	O	S	0	0	0
			5406	3419	929	1037	21			

There are 32 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-15	MET	-	initiating methionine	UNP O53872
A	-14	GLY	-	expression tag	UNP O53872
A	-13	SER	-	expression tag	UNP O53872
A	-12	SER	-	expression tag	UNP O53872
A	-11	HIS	-	expression tag	UNP O53872
A	-10	HIS	-	expression tag	UNP O53872
A	-9	HIS	-	expression tag	UNP O53872
A	-8	HIS	-	expression tag	UNP O53872
A	-7	HIS	-	expression tag	UNP O53872
A	-6	HIS	-	expression tag	UNP O53872
A	-5	SER	-	expression tag	UNP O53872
A	-4	GLN	-	expression tag	UNP O53872
A	-3	ASP	-	expression tag	UNP O53872
A	-2	PRO	-	expression tag	UNP O53872
A	-1	ASN	-	expression tag	UNP O53872
A	0	SER	-	expression tag	UNP O53872
B	-15	MET	-	initiating methionine	UNP O53872
B	-14	GLY	-	expression tag	UNP O53872
B	-13	SER	-	expression tag	UNP O53872
B	-12	SER	-	expression tag	UNP O53872
B	-11	HIS	-	expression tag	UNP O53872
B	-10	HIS	-	expression tag	UNP O53872
B	-9	HIS	-	expression tag	UNP O53872
B	-8	HIS	-	expression tag	UNP O53872
B	-7	HIS	-	expression tag	UNP O53872

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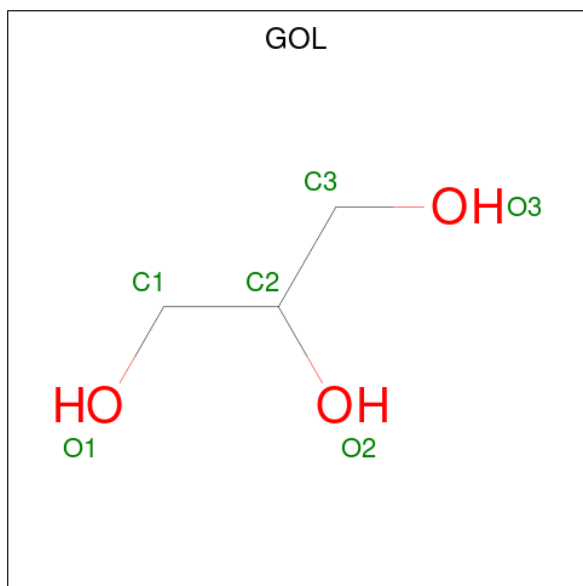
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Chain	Residue	Modelled	Actual	Comment	Reference
B	-6	HIS	-	expression tag	UNP O53872
B	-5	SER	-	expression tag	UNP O53872
B	-4	GLN	-	expression tag	UNP O53872
B	-3	ASP	-	expression tag	UNP O53872
B	-2	PRO	-	expression tag	UNP O53872
B	-1	ASN	-	expression tag	UNP O53872
B	0	SER	-	expression tag	UNP O53872

- Molecule 2 is a protein called Putative acyltransferase Rv0859.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	C	396	Total	C	N	O	S	0	0	0
			2921	1822	519	565	15			
2	D	394	Total	C	N	O	S	0	0	0
			2909	1816	517	561	15			

- Molecule 3 is GLYCEROL (three-letter code: GOL) (formula: C₃H₈O₃).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	C	O	0	0
			6	3	3		
3	B	1	Total	C	O	0	0
			6	3	3		

- Molecule 4 is SULFATE ION (three-letter code: SO4) (formula: O₄S).



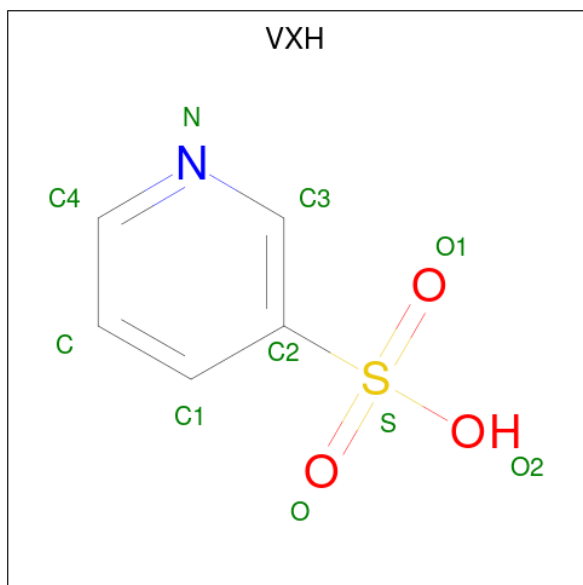
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	1	Total O S 5 4 1	0	0
4	A	1	Total O S 5 4 1	0	0
4	A	1	Total O S 5 4 1	0	0
4	B	1	Total O S 5 4 1	0	0
4	B	1	Total O S 5 4 1	0	0
4	B	1	Total O S 5 4 1	0	0
4	C	1	Total O S 5 4 1	0	0
4	C	1	Total O S 5 4 1	0	0
4	C	1	Total O S 5 4 1	0	0
4	C	1	Total O S 5 4 1	0	0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

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

- Molecule 5 is pyridine-3-sulfonic acid (three-letter code: VXH) (formula: $C_5H_5NO_3S$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
5	A	1	Total	C	N	O	S	0	0
			10	5	1	3	1		
5	A	1	Total	C	N	O	S	0	0
			10	5	1	3	1		
5	B	1	Total	C	N	O	S	0	0
			10	5	1	3	1		
5	B	1	Total	C	N	O	S	0	0
			10	5	1	3	1		
5	B	1	Total	C	N	O	S	0	0
			10	5	1	3	1		
5	C	1	Total	C	N	O	S	0	0
			10	5	1	3	1		
5	D	1	Total	C	N	O	S	0	1
			20	10	2	6	2		

- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	41	Total	O	0	0
			41	41		

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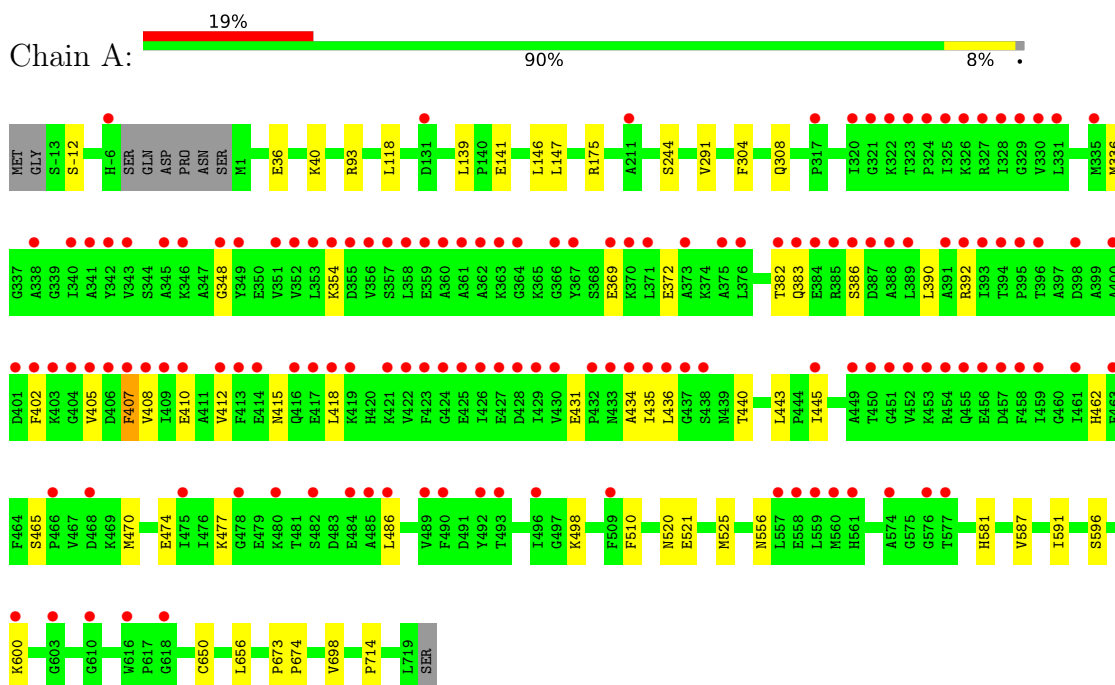
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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	B	62	Total 62	O 62	0	0
6	C	39	Total 39	O 39	0	0
6	D	40	Total 40	O 40	0	0

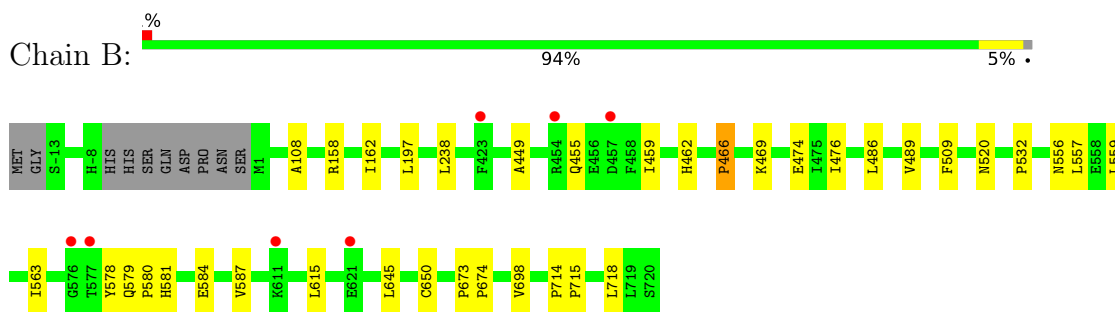
3 Residue-property plots i

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.

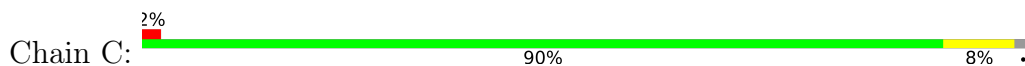
- Molecule 1: Probable fatty oxidation protein FadB

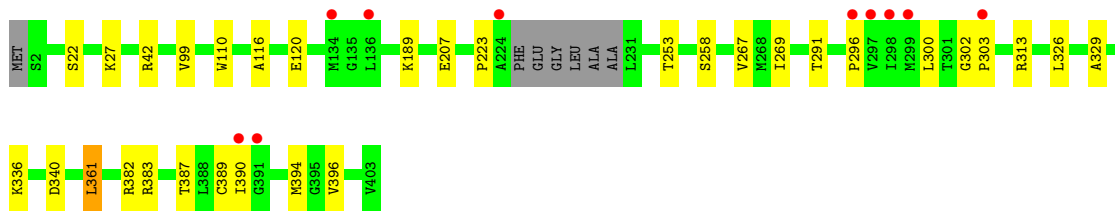


- Molecule 1: Probable fatty oxidation protein FadB

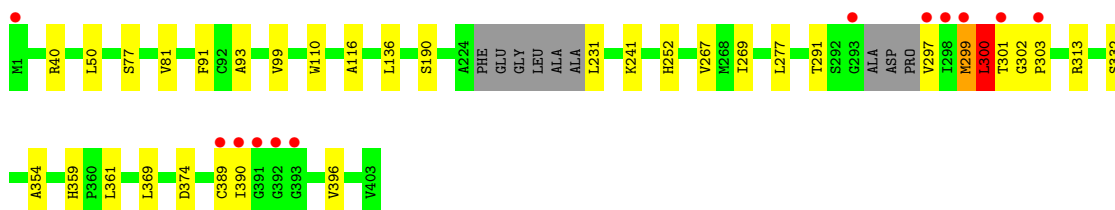
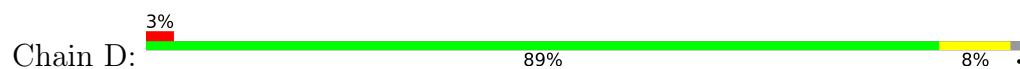


- Molecule 2: Putative acyltransferase Rv0859





● Molecule 2: Putative acyltransferase Rv0859



4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	250.78Å 136.14Å 121.05Å 90.00° 110.42° 90.00°	Depositor
Resolution (Å)	46.96 – 2.60 58.75 – 2.60	Depositor EDS
% Data completeness (in resolution range)	99.4 (46.96-2.60) 99.4 (58.75-2.60)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.56 (at 2.61Å)	Xtrriage
Refinement program	PHENIX 1.19.2_4158	Depositor
R, R_{free}	0.188 , 0.225 0.186 , 0.223	Depositor DCC
R_{free} test set	5842 reflections (5.01%)	wwPDB-VP
Wilson B-factor (Å ²)	71.1	Xtrriage
Anisotropy	0.210	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 51.2	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	17006	wwPDB-VP
Average B, all atoms (Å ²)	85.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.84% 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, SO4, GOL, VXH

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	0.24	0/5514	0.46	0/7460
1	B	0.24	0/5497	0.46	0/7437
2	C	0.24	0/2964	0.50	0/4012
2	D	0.24	0/2950	0.49	0/3990
All	All	0.24	0/16925	0.47	0/22899

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts [i](#)

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

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	5421	0	5456	33	0
1	B	5406	0	5447	20	0
2	C	2921	0	2937	21	0
2	D	2909	0	2934	22	0
3	A	6	0	8	0	0
3	B	6	0	8	0	0
4	A	15	0	0	0	0
4	B	15	0	0	0	0
4	C	20	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
4	D	25	0	0	0	0
5	A	20	0	0	0	0
5	B	30	0	0	0	0
5	C	10	0	0	0	0
5	D	20	0	0	0	0
6	A	41	0	0	0	0
6	B	62	0	0	1	0
6	C	39	0	0	0	0
6	D	40	0	0	0	0
All	All	17006	0	16790	90	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 3.

All (90) 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:596:SER:HB3	1:A:600:LYS:HD2	1.76	0.67
1:A:336:MET:HG2	1:A:465:SER:HB3	1.78	0.65
2:D:50:LEU:HD21	2:D:277:LEU:HD23	1.82	0.62
2:D:299:MET:O	2:D:301:THR:N	2.32	0.61
2:C:99:VAL:HG13	2:C:269:ILE:HD11	1.83	0.61
2:D:252:HIS:HE1	2:D:332:SER:H	1.50	0.59
1:A:408:VAL:HB	1:A:436:LEU:HA	1.85	0.59
2:D:291:THR:HG22	2:D:396:VAL:HG22	1.83	0.59
2:D:99:VAL:HG13	2:D:269:ILE:HD11	1.85	0.59
1:B:462:HIS:HB3	1:B:474:GLU:HB3	1.85	0.58
1:B:459:ILE:HG21	1:B:489:VAL:HG21	1.85	0.58
1:A:415:ASN:HB3	1:A:418:LEU:HB3	1.87	0.57
2:C:313:ARG:HD3	2:D:110:TRP:CD1	2.41	0.56
2:C:300:LEU:HA	2:C:389:CYS:HB2	1.87	0.55
1:B:520:ASN:HB3	1:B:581:HIS:CE1	2.41	0.55
1:A:354:LYS:HB2	1:A:402:PHE:HE2	1.73	0.53
1:A:-12:SER:O	1:A:93:ARG:NH1	2.39	0.53
1:A:244:SER:HB3	2:D:231:LEU:HD13	1.91	0.52
2:C:296:PRO:HD3	2:D:81:VAL:HG21	1.91	0.52
2:D:300:LEU:HA	2:D:389:CYS:HB2	1.91	0.52
2:D:91:PHE:HB2	2:D:390:ILE:HG23	1.92	0.51
2:D:299:MET:C	2:D:301:THR:H	2.13	0.51
2:C:22:SER:OG	2:C:207:GLU:OE2	2.21	0.51
2:D:190:SER:OG	2:D:374:ASP:OD2	2.17	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:C:223:PRO:HA	2:C:253:THR:HG22	1.93	0.51
2:C:110:TRP:O	2:D:313:ARG:NH1	2.44	0.50
2:C:258:SER:HB3	2:C:329:ALA:HA	1.94	0.50
1:A:348:GLY:HA2	1:A:392:ARG:NH1	2.27	0.50
1:B:466:PRO:HG2	1:B:469:LYS:HE3	1.93	0.50
1:A:36:GLU:HG3	1:A:40:LYS:HE3	1.94	0.50
2:C:303:PRO:HD3	2:C:389:CYS:HA	1.92	0.50
1:A:410:GLU:OE2	1:A:412:VAL:HG22	2.12	0.49
2:C:27:LYS:NZ	2:D:136:LEU:O	2.45	0.49
1:A:440:THR:HG21	1:A:443:LEU:HB2	1.94	0.49
1:A:462:HIS:HB3	1:A:474:GLU:HB3	1.94	0.49
2:C:302:GLY:N	2:C:303:PRO:HD2	2.28	0.48
2:D:241:LYS:HD3	2:D:297:VAL:HG21	1.94	0.48
1:A:118:LEU:HD23	1:A:139:LEU:HG	1.95	0.48
2:D:354:ALA:HB1	2:D:359:HIS:HB2	1.96	0.48
1:A:405:VAL:O	1:A:434:ALA:HB2	2.13	0.48
1:B:532:PRO:HB2	1:B:615:LEU:HD13	1.96	0.47
1:B:579:GLN:NE2	1:B:580:PRO:O	2.47	0.47
2:C:110:TRP:CD1	2:D:313:ARG:HD3	2.49	0.47
1:B:557:LEU:HB3	1:B:587:VAL:HG13	1.97	0.47
2:C:336:LYS:NZ	2:C:340:ASP:OD2	2.46	0.47
1:A:405:VAL:N	1:A:431:GLU:HG2	2.30	0.47
1:B:578:TYR:OH	1:B:584:GLU:OE2	2.32	0.46
2:D:93:ALA:HB3	2:D:390:ILE:HD11	1.97	0.46
1:B:698:VAL:HG13	1:B:714:PRO:HG3	1.97	0.46
1:A:407:PHE:HE1	1:A:435:ILE:HD12	1.81	0.45
1:A:698:VAL:HG13	1:A:714:PRO:HG3	1.97	0.45
1:B:162:ILE:HD12	1:B:238:LEU:HD21	1.99	0.45
1:B:476:ILE:HG21	1:B:509:PHE:CE1	2.52	0.45
1:B:459:ILE:HD11	1:B:486:LEU:HD12	1.99	0.45
2:D:116:ALA:O	2:D:267:VAL:N	2.48	0.44
1:A:304:PHE:O	1:A:308:GLN:HB2	2.18	0.44
1:B:158:ARG:NH1	6:B:2501:HOH:O	2.48	0.44
2:D:99:VAL:HG11	2:D:369:LEU:HD22	2.00	0.44
1:A:369:GLU:HG2	1:A:390:LEU:HD21	2.00	0.44
1:B:715:PRO:HD2	1:B:718:LEU:HD12	1.98	0.44
2:C:390:ILE:HB	2:C:394:MET:HB2	2.00	0.44
1:A:510:PHE:CD1	1:A:656:LEU:HD11	2.53	0.43
1:A:470:MET:O	1:A:498:LYS:NZ	2.37	0.43
1:A:141:GLU:HG3	1:A:147:LEU:C	2.39	0.43
1:B:714:PRO:HA	1:B:715:PRO:HD3	1.91	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:445:ILE:HD12	1:A:445:ILE:HA	1.91	0.42
2:C:390:ILE:HD11	2:C:396:VAL:HG23	2.01	0.42
1:A:354:LYS:HB2	1:A:402:PHE:CE2	2.54	0.42
1:B:673:PRO:HA	1:B:674:PRO:HD3	1.91	0.42
1:A:520:ASN:HB3	1:A:581:HIS:CE1	2.54	0.42
1:A:587:VAL:O	1:A:591:ILE:HG12	2.20	0.42
1:B:559:LEU:O	1:B:563:ILE:HG12	2.20	0.42
2:C:291:THR:HG22	2:C:396:VAL:HG22	2.01	0.42
2:C:326:LEU:HD13	2:C:387:THR:HG23	2.02	0.41
1:A:382:THR:HG22	1:A:383:GLN:H	1.85	0.41
1:A:521:GLU:O	1:A:525:MET:HG3	2.20	0.41
1:A:477:LYS:HG3	1:A:486:LEU:HD21	2.03	0.41
2:C:42:ARG:NH2	2:C:189:LYS:O	2.51	0.41
2:D:302:GLY:N	2:D:303:PRO:HD2	2.35	0.41
2:C:382:ARG:HG3	2:C:383:ARG:HG3	2.02	0.41
1:A:146:LEU:HD22	1:A:291:VAL:HG22	2.02	0.41
1:A:407:PHE:CE1	1:A:435:ILE:HD12	2.55	0.41
2:C:120:GLU:HG2	2:C:361:LEU:HB2	2.03	0.41
2:D:40:ARG:NH1	2:D:77:SER:O	2.45	0.41
1:A:673:PRO:HA	1:A:674:PRO:HD3	1.97	0.40
2:C:116:ALA:O	2:C:267:VAL:N	2.52	0.40
1:B:108:ALA:HB1	1:B:197:LEU:HB3	2.02	0.40
1:A:372:GLU:HB3	1:A:386:SER:OG	2.21	0.40
1:B:645:LEU:HD22	1:B:715:PRO:HD3	2.02	0.40
1:B:449:ALA:O	1:B:455:GLN:HG2	2.22	0.40

There are no symmetry-related clashes.

5.3 Torsion angles [i](#)

5.3.1 Protein backbone [i](#)

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles
1	A	722/736 (98%)	693 (96%)	28 (4%)	1 (0%)	51 75

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles
1	B	721/736 (98%)	696 (96%)	24 (3%)	1 (0%)	51 75
2	C	392/403 (97%)	379 (97%)	12 (3%)	1 (0%)	41 64
2	D	388/403 (96%)	377 (97%)	8 (2%)	3 (1%)	19 39
All	All	2223/2278 (98%)	2145 (96%)	72 (3%)	6 (0%)	41 64

All (6) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	C	361	LEU
2	D	300	LEU
2	D	361	LEU
1	B	556	ASN
1	A	556	ASN
2	D	299	MET

5.3.2 Protein sidechains [i](#)

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
1	A	557/565 (99%)	555 (100%)	2 (0%)	91 97
1	B	556/565 (98%)	555 (100%)	1 (0%)	93 98
2	C	305/310 (98%)	305 (100%)	0	100 100
2	D	304/310 (98%)	303 (100%)	1 (0%)	92 98
All	All	1722/1750 (98%)	1718 (100%)	4 (0%)	93 98

All (4) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	175	ARG
1	A	407	PHE
1	B	466	PRO
2	D	300	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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	B	650	1	7,8,9	0.97	0	6,11,13	1.74	3 (50%)
1	OCS	A	650	1	7,8,9	0.97	0	6,11,13	1.79	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	B	650	1	-	3/4/7/9	-
1	OCS	A	650	1	-	3/4/7/9	-

There are no bond length outliers.

All (6) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	650	OCS	OD2-SG-CB	2.53	109.77	105.74
1	A	650	OCS	OD1-SG-CB	2.50	109.91	106.94
1	A	650	OCS	OD2-SG-CB	2.40	109.57	105.74
1	B	650	OCS	OD1-SG-CB	2.11	109.45	106.94
1	B	650	OCS	OD3-SG-CB	2.07	109.40	106.94
1	A	650	OCS	OD3-SG-CB	2.03	109.35	106.94

There are no chirality outliers.

All (6) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
1	A	650	OCS	CA-CB-SG-OD1
1	A	650	OCS	CA-CB-SG-OD2
1	A	650	OCS	CA-CB-SG-OD3
1	B	650	OCS	CA-CB-SG-OD1
1	B	650	OCS	CA-CB-SG-OD2
1	B	650	OCS	CA-CB-SG-OD3

There are no ring outliers.

No monomer is involved in short contacts.

5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

5.6 Ligand geometry [i](#)

25 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	SO4	C	504	-	4,4,4	0.14	0	6,6,6	0.05	0
3	GOL	B	2401	-	5,5,5	0.88	0	5,5,5	1.03	0
3	GOL	A	2401	-	5,5,5	0.89	0	5,5,5	1.03	0
4	SO4	C	503	-	4,4,4	0.14	0	6,6,6	0.05	0
5	VXH	C	505	-	10,10,10	0.24	0	13,14,14	0.18	0
4	SO4	D	504	-	4,4,4	0.14	0	6,6,6	0.05	0
5	VXH	D	506[A]	-	10,10,10	0.23	0	13,14,14	0.18	0
5	VXH	B	2407	-	10,10,10	0.23	0	13,14,14	0.18	0
4	SO4	D	505	-	4,4,4	0.14	0	6,6,6	0.04	0
4	SO4	D	502	-	4,4,4	0.14	0	6,6,6	0.05	0
4	SO4	B	2402	-	4,4,4	0.14	0	6,6,6	0.05	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
5	VXH	A	2405	-	10,10,10	0.15	0	13,14,14	0.19	0
5	VXH	D	506[B]	-	10,10,10	0.23	0	13,14,14	0.18	0
4	SO4	B	2403	-	4,4,4	0.14	0	6,6,6	0.05	0
4	SO4	A	2402	-	4,4,4	0.14	0	6,6,6	0.04	0
4	SO4	D	501	-	4,4,4	0.14	0	6,6,6	0.05	0
4	SO4	C	502	-	4,4,4	0.14	0	6,6,6	0.06	0
4	SO4	A	2403	-	4,4,4	0.14	0	6,6,6	0.05	0
5	VXH	B	2405	-	10,10,10	0.22	0	13,14,14	0.18	0
4	SO4	D	503	-	4,4,4	0.14	0	6,6,6	0.05	0
5	VXH	B	2406	-	10,10,10	0.25	0	13,14,14	0.18	0
5	VXH	A	2406	-	10,10,10	0.23	0	13,14,14	0.18	0
4	SO4	B	2404	-	4,4,4	0.14	0	6,6,6	0.05	0
4	SO4	A	2404	-	4,4,4	0.14	0	6,6,6	0.05	0
4	SO4	C	501	-	4,4,4	0.14	0	6,6,6	0.05	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
5	VXH	B	2405	-	-	0/6/6/6	0/1/1/1
3	GOL	B	2401	-	-	1/4/4/4	-
3	GOL	A	2401	-	-	0/4/4/4	-
5	VXH	A	2405	-	-	0/6/6/6	0/1/1/1
5	VXH	B	2406	-	-	1/6/6/6	0/1/1/1
5	VXH	C	505	-	-	1/6/6/6	0/1/1/1
5	VXH	A	2406	-	-	0/6/6/6	0/1/1/1
5	VXH	D	506[B]	-	-	0/6/6/6	0/1/1/1
5	VXH	D	506[A]	-	-	0/6/6/6	0/1/1/1
5	VXH	B	2407	-	-	0/6/6/6	0/1/1/1

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

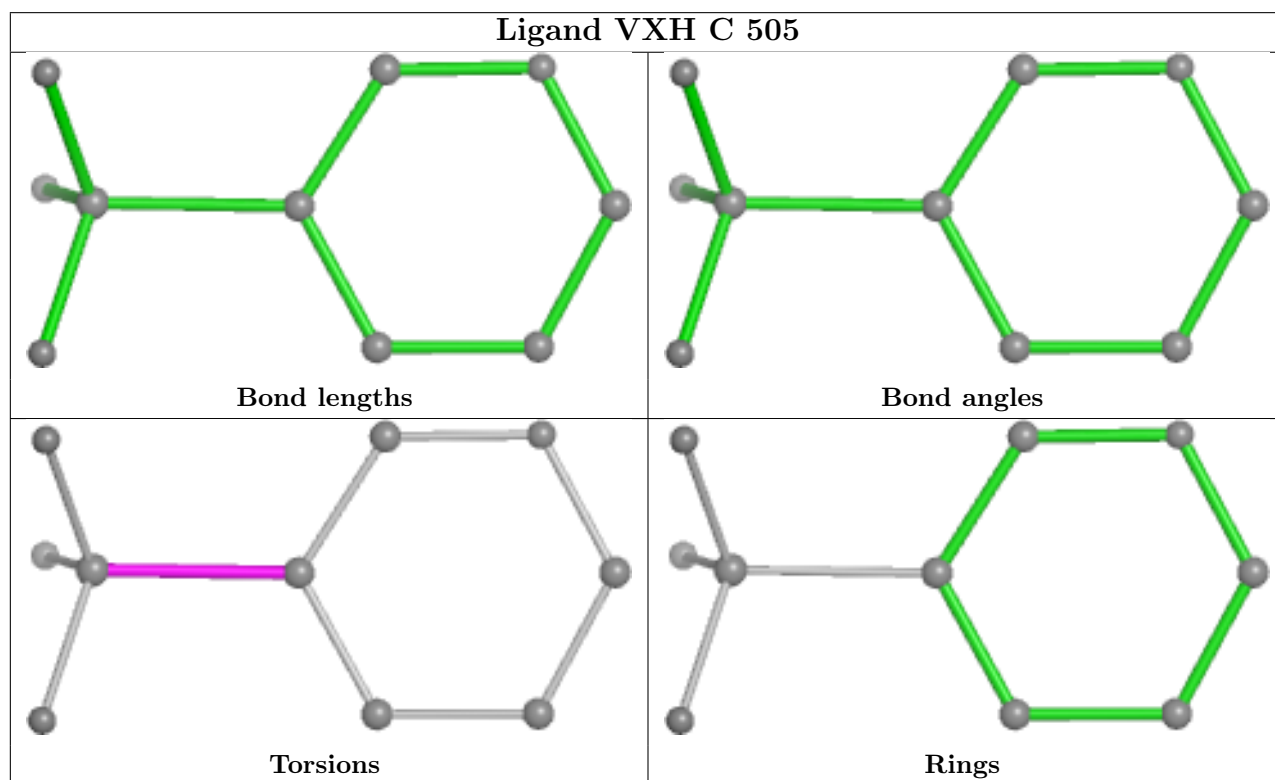
All (3) torsion outliers are listed below:

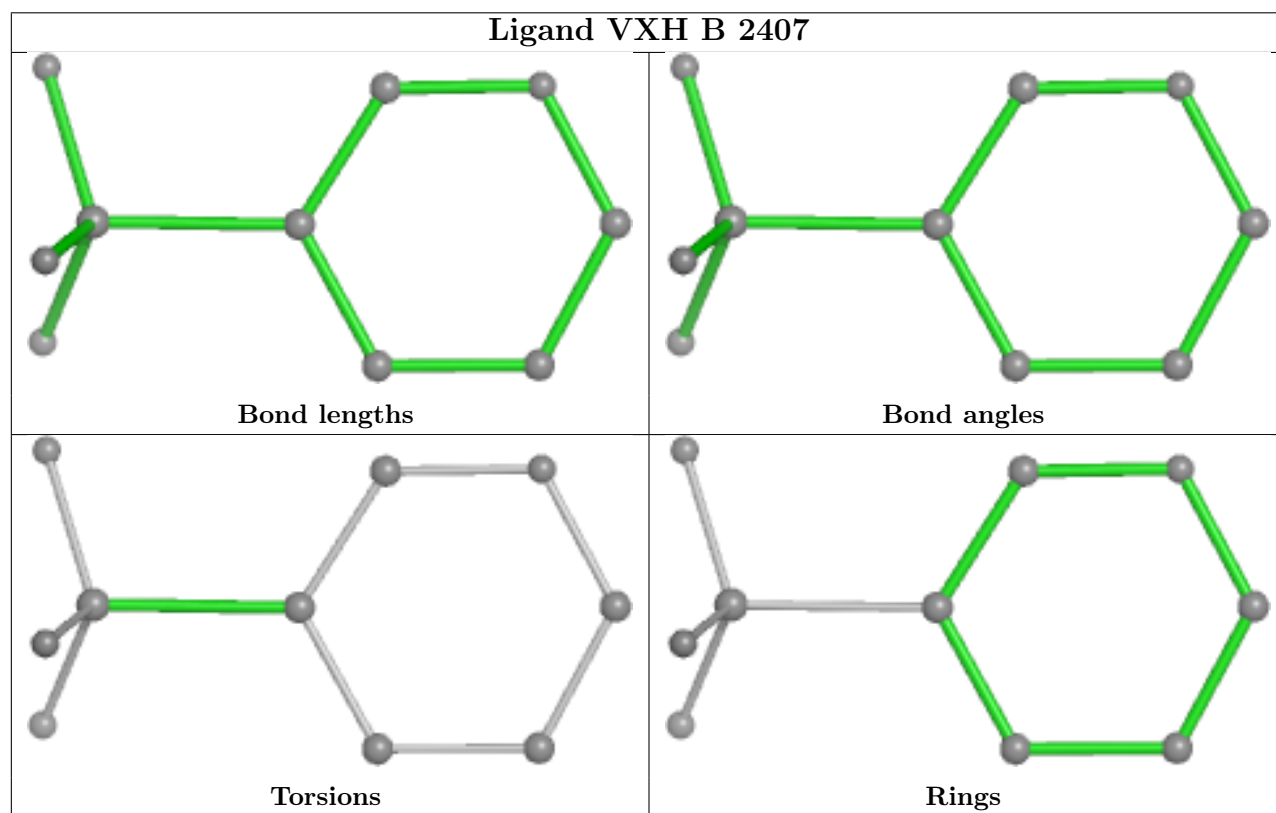
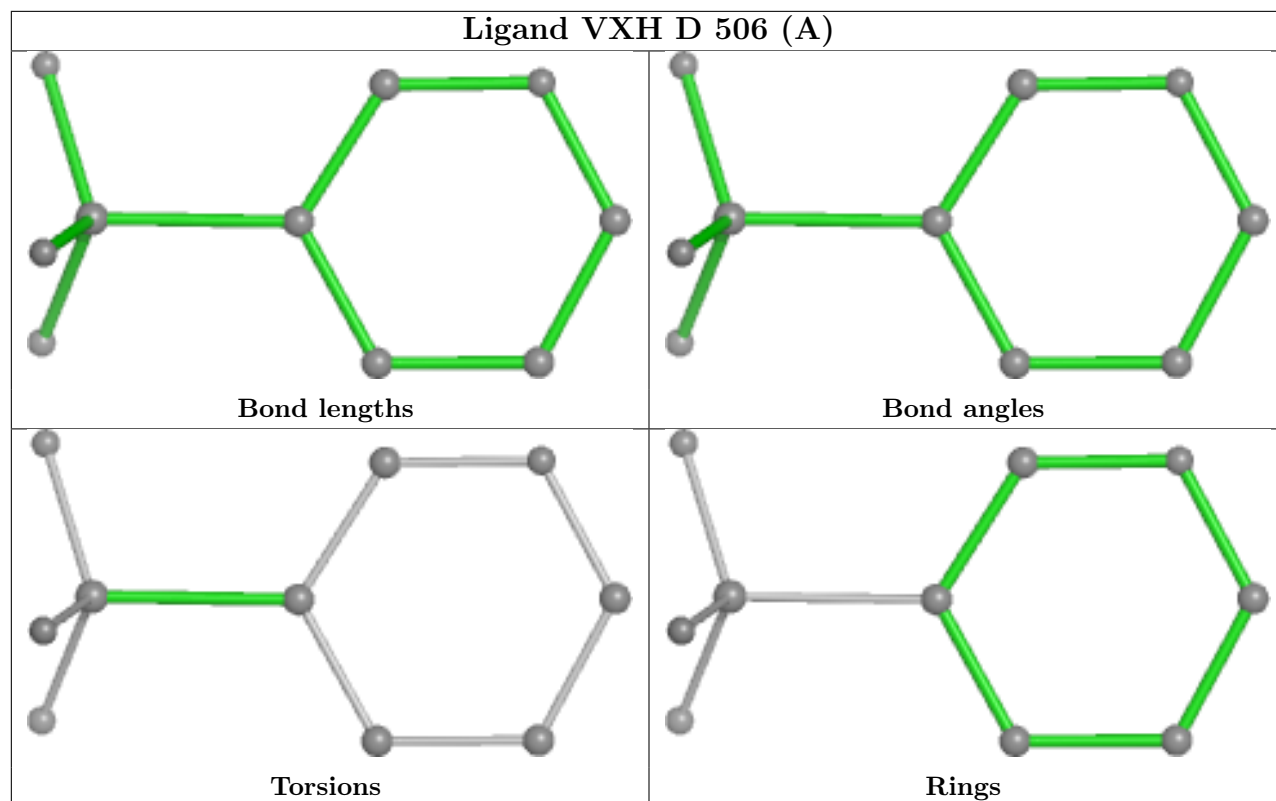
Mol	Chain	Res	Type	Atoms
5	B	2406	VXH	C3-C2-S-O1
5	C	505	VXH	C3-C2-S-O1
3	B	2401	GOL	O1-C1-C2-O2

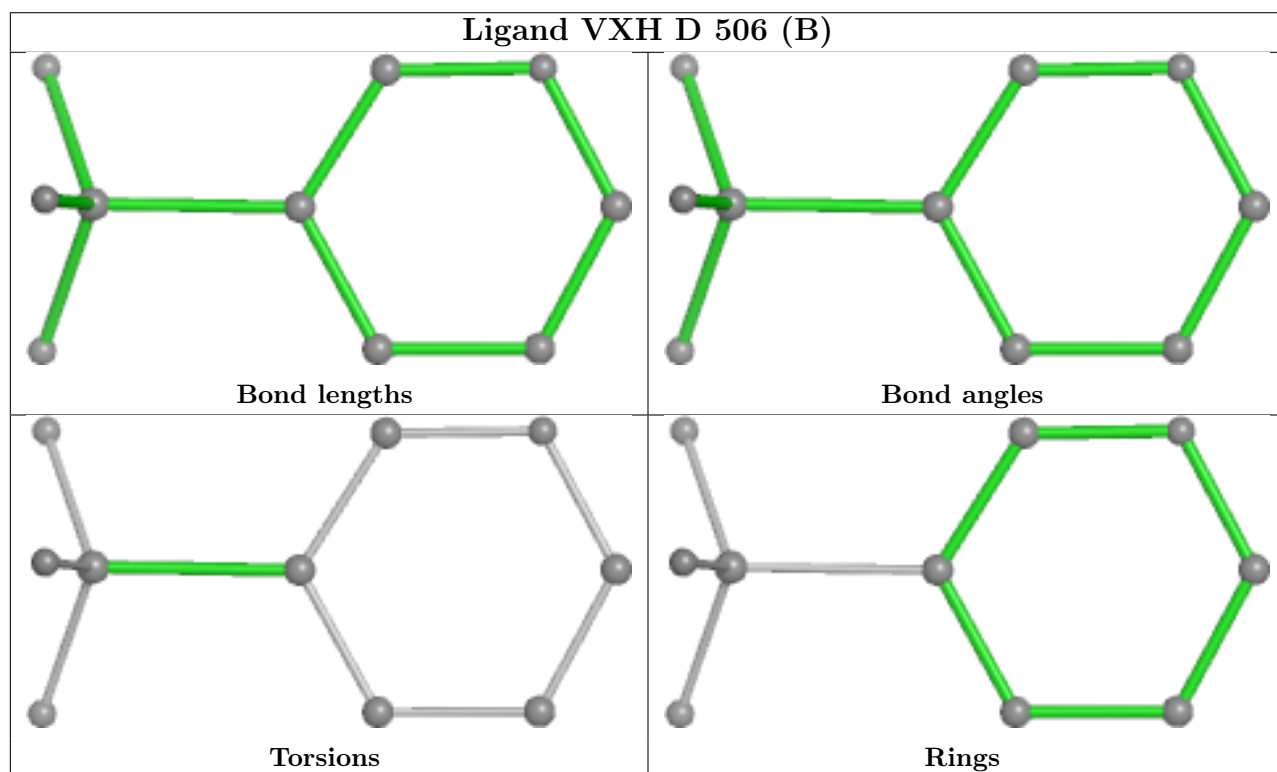
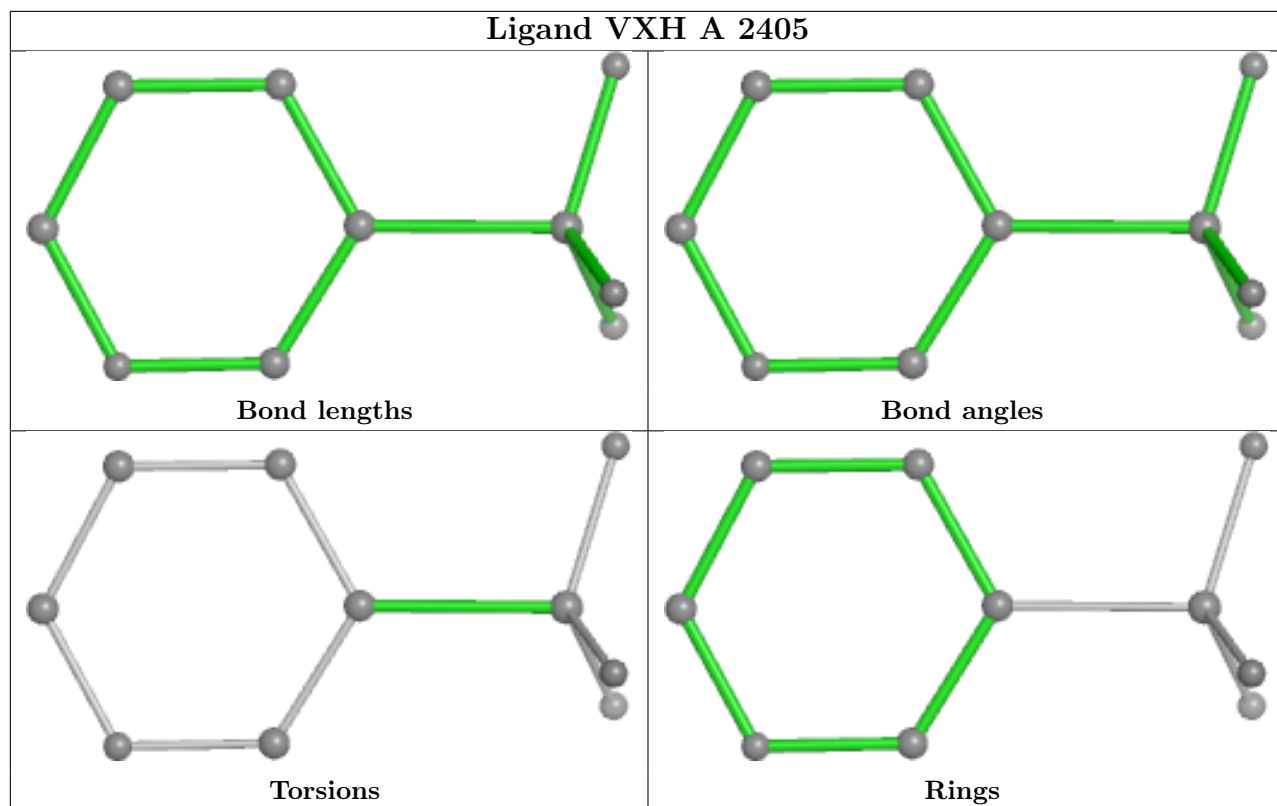
There are no ring outliers.

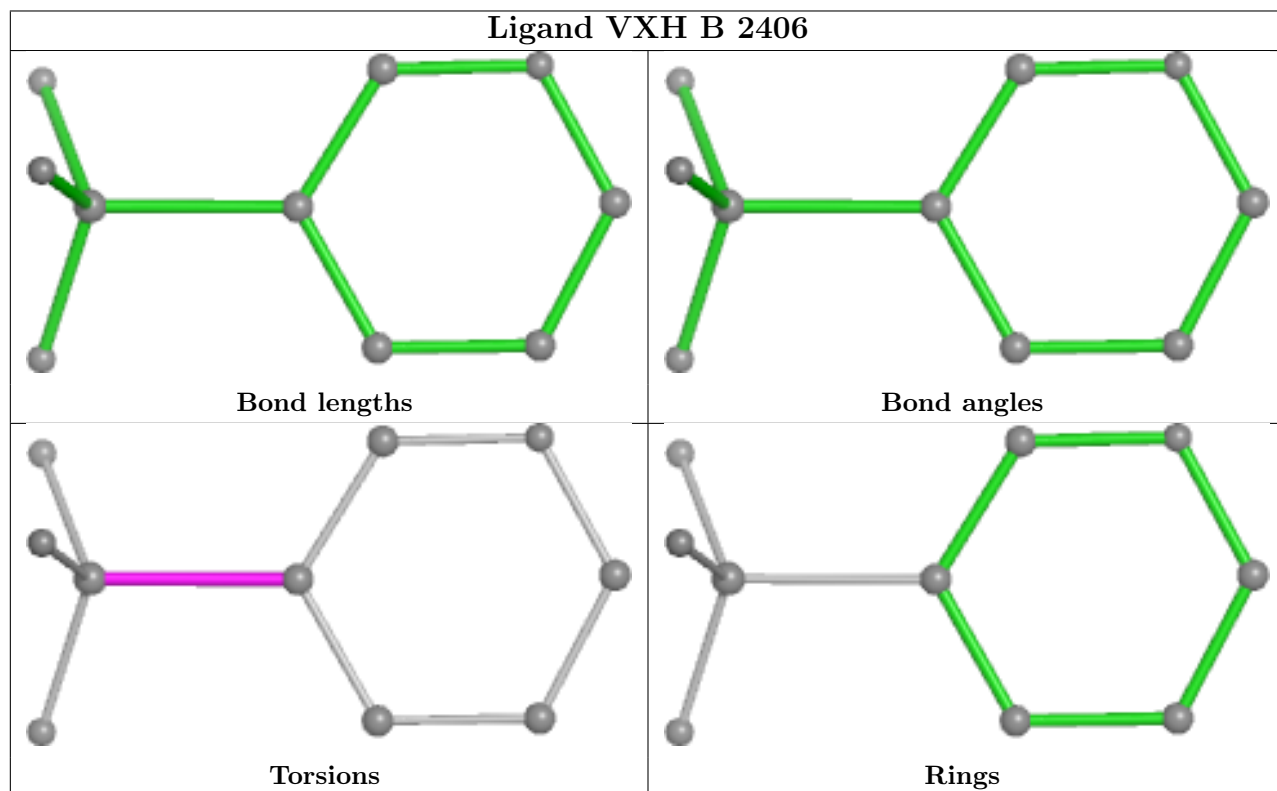
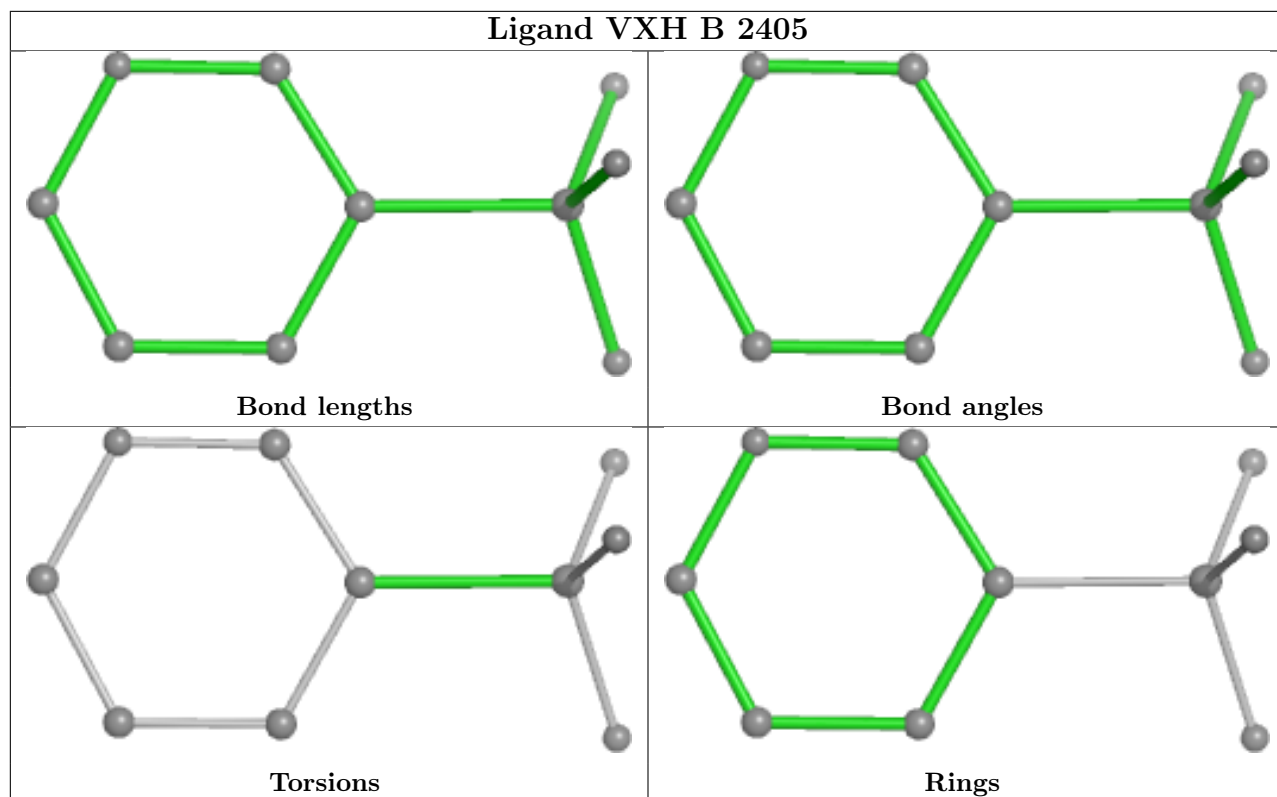
No monomer is involved in short contacts.

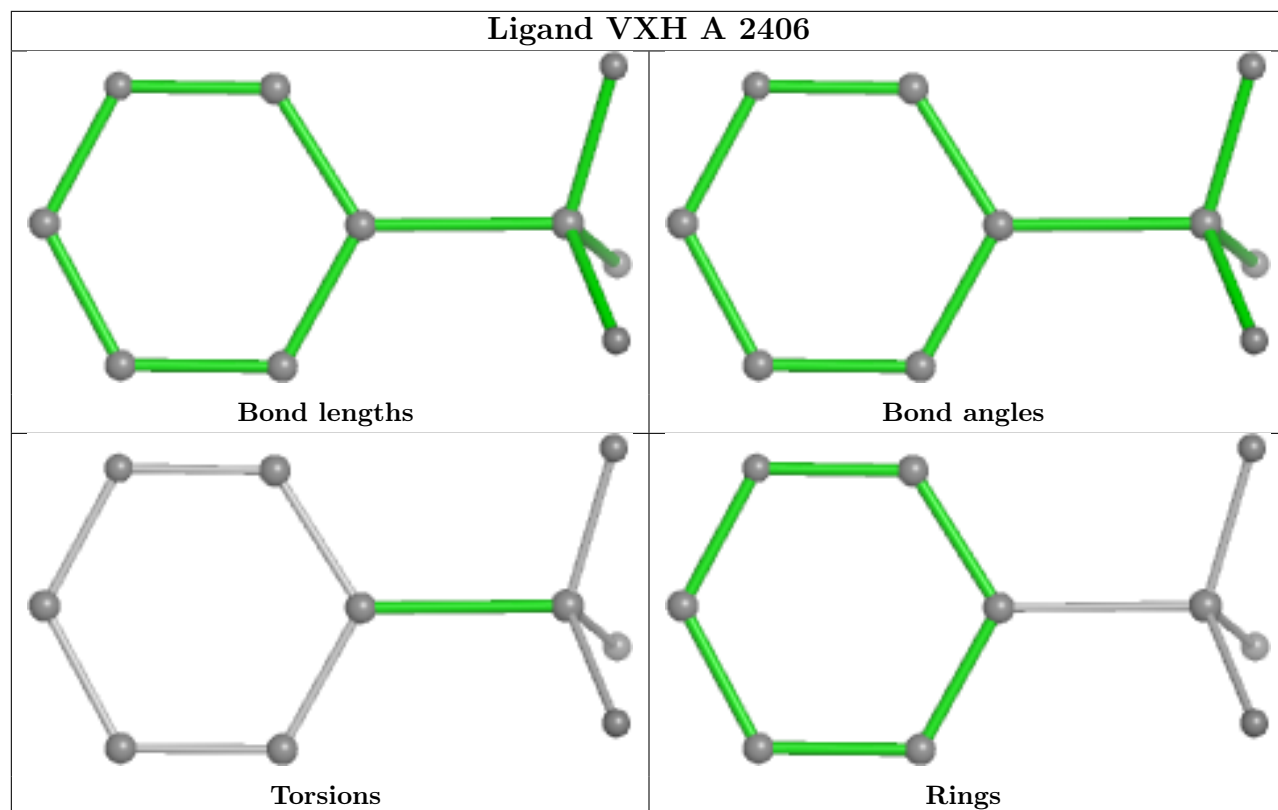
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. 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	726/736 (98%)	0.98	140 (19%) 1 0	52, 88, 186, 251	0
1	B	725/736 (98%)	0.05	7 (0%) 82 80	48, 75, 123, 154	0
2	C	396/403 (98%)	0.19	10 (2%) 57 51	44, 65, 105, 142	0
2	D	394/403 (97%)	0.26	12 (3%) 50 43	47, 68, 105, 169	0
All	All	2241/2278 (98%)	0.41	169 (7%) 14 10	44, 74, 161, 251	0

All (169) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	351	VAL	16.4
1	A	367	TYR	12.2
1	A	349	TYR	12.1
1	A	434	ALA	11.6
1	A	405	VAL	11.3
1	A	325	ILE	11.1
1	A	352	VAL	11.0
1	A	426	ILE	8.6
1	A	371	LEU	8.4
1	A	402	PHE	8.2
1	A	436	LEU	8.1
1	A	391	ALA	8.0
1	A	408	VAL	7.9
1	A	394	THR	7.8
1	A	328	ILE	7.8
1	A	452	VAL	7.4
1	A	407	PHE	7.3
1	A	425	GLU	7.2
1	A	362	ALA	7.1
1	A	430	VAL	6.9
1	A	409	ILE	6.9

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Mol	Chain	Res	Type	RSRZ
1	A	342	TYR	6.5
1	A	356	VAL	6.4
1	A	343	VAL	6.3
1	A	423	PHE	6.3
1	A	382	THR	6.3
1	A	353	LEU	6.0
1	A	331	LEU	5.8
1	A	387	ASP	5.8
1	A	486	LEU	5.7
1	A	422	VAL	5.6
1	A	358	LEU	5.5
1	A	357	SER	5.4
1	A	429	ILE	5.4
1	A	433	ASN	5.3
1	A	406	ASP	5.3
1	A	320	ILE	5.2
1	A	454	ARG	5.1
2	C	297	VAL	5.1
1	A	413	PHE	5.1
1	A	459	ILE	4.9
1	A	389	LEU	4.9
1	A	404	GLY	4.8
1	A	383	GLN	4.8
2	C	299	MET	4.8
2	D	301	THR	4.6
1	A	455	GLN	4.6
1	A	321	GLY	4.5
1	A	327	ARG	4.5
1	A	453	LYS	4.4
1	A	398	ASP	4.3
1	A	-6	HIS	4.3
2	D	298	ILE	4.3
1	A	424	GLY	4.2
2	D	293	GLY	4.1
1	A	396	THR	4.1
1	A	485	ALA	4.1
1	A	359	GLU	4.0
1	A	386	SER	4.0
2	D	391	GLY	3.9
1	A	345	ALA	3.9
2	D	299	MET	3.9
1	A	393	ILE	3.9

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Mol	Chain	Res	Type	RSRZ
1	A	338	ALA	3.9
1	A	458	PHE	3.9
1	A	414	GLU	3.8
1	A	340	ILE	3.8
1	A	400	ALA	3.8
1	A	557	LEU	3.7
1	A	355	ASP	3.7
1	A	403	LYS	3.7
1	B	577	THR	3.7
1	A	468	ASP	3.7
1	A	322	LYS	3.6
2	D	297	VAL	3.6
1	A	392	ARG	3.6
2	C	298	ILE	3.6
1	A	360	ALA	3.5
2	D	390	ILE	3.5
1	A	480	LYS	3.5
1	A	560	MET	3.5
1	A	435	ILE	3.5
1	A	375	ALA	3.4
1	A	421	LYS	3.4
1	A	364	GLY	3.4
2	D	1	MET	3.4
1	A	326	LYS	3.3
1	A	490	PHE	3.3
1	A	461	ILE	3.3
1	A	401	ASP	3.2
2	D	392	GLY	3.1
1	A	437	GLY	3.1
1	A	600	LYS	3.1
1	A	317	PRO	3.1
1	A	445	ILE	3.1
1	A	576	GLY	3.0
1	A	366	GLY	3.0
1	A	348	GLY	3.0
1	A	450	THR	3.0
1	A	388	ALA	3.0
2	C	303	PRO	3.0
1	B	576	GLY	3.0
2	C	134	MET	2.9
1	A	577	THR	2.9
1	A	329	GLY	2.9

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Mol	Chain	Res	Type	RSRZ
1	A	492	TYR	2.9
1	A	370	LYS	2.8
1	A	482	SER	2.8
1	A	324	PRO	2.7
2	D	303	PRO	2.7
1	A	384	GLU	2.7
1	A	466	PRO	2.7
1	A	456	GLU	2.7
1	A	558	GLU	2.7
1	A	603	GLY	2.7
1	A	432	PRO	2.7
1	A	419	LYS	2.7
1	A	561	HIS	2.6
1	A	395	PRO	2.6
1	A	484	GLU	2.6
1	A	361	ALA	2.6
1	A	451	GLY	2.6
1	A	369	GLU	2.6
1	A	354	LYS	2.6
1	A	428	ASP	2.6
1	A	496	ILE	2.6
1	A	341	ALA	2.6
1	A	330	VAL	2.6
1	A	449	ALA	2.5
1	A	574	ALA	2.5
1	A	489	VAL	2.5
2	C	390	ILE	2.5
1	A	509	PHE	2.5
1	A	323	THR	2.5
1	A	335	MET	2.5
1	A	457	ASP	2.5
1	A	493	THR	2.5
1	A	618	GLY	2.4
1	B	457	ASP	2.4
1	A	410	GLU	2.4
1	A	438	SER	2.4
1	A	463	PHE	2.4
1	A	418	LEU	2.4
1	A	417	GLU	2.3
2	C	391	GLY	2.3
2	D	393	GLY	2.3
1	A	416	GLN	2.3

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Mol	Chain	Res	Type	RSRZ
1	A	385	ARG	2.2
1	A	478	GLY	2.2
1	A	559	LEU	2.2
1	A	373	ALA	2.2
2	C	136	LEU	2.2
1	A	363	LYS	2.1
1	A	131	ASP	2.1
1	A	211	ALA	2.1
1	A	616	TRP	2.1
1	A	412	VAL	2.1
1	B	611	LYS	2.1
1	B	423	PHE	2.1
1	A	346	LYS	2.1
1	B	454	ARG	2.1
1	A	427	GLU	2.1
1	A	376	LEU	2.1
1	A	475	ILE	2.1
1	B	621	GLU	2.0
2	C	296	PRO	2.0
2	C	224	ALA	2.0
1	A	610	GLY	2.0
2	D	389	CYS	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(Å ²)	Q<0.9
1	OCS	A	650	9/10	0.91	0.25	71,83,103,106	0
1	OCS	B	650	9/10	0.91	0.22	57,61,92,108	0

6.3 Carbohydrates [i](#)

There are no monosaccharides in this entry.

6.4 Ligands [i](#)

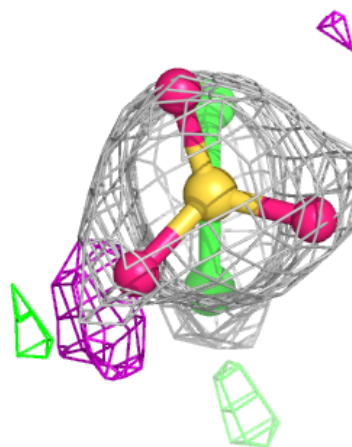
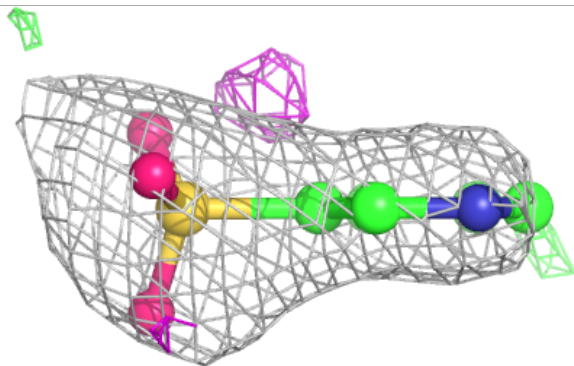
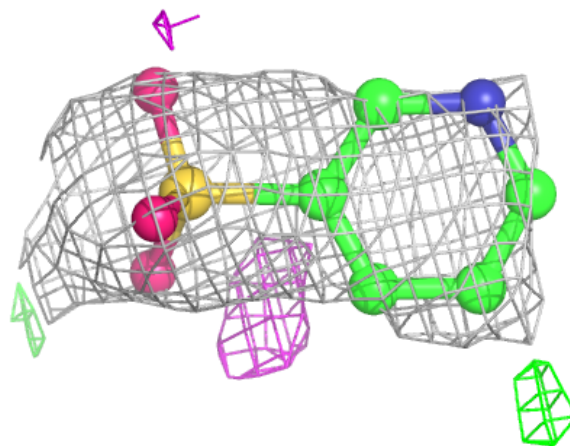
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
4	SO4	C	504	5/5	0.76	0.25	121,134,148,185	0
4	SO4	B	2404	5/5	0.78	0.28	122,135,142,166	0
4	SO4	D	505	5/5	0.83	0.14	104,106,131,152	0
4	SO4	D	504	5/5	0.85	0.15	123,133,137,141	5
4	SO4	C	503	5/5	0.87	0.20	115,124,140,140	0
5	VXH	B	2407	10/10	0.88	0.28	113,128,156,182	0
5	VXH	D	506[A]	10/10	0.88	0.42	71,79,97,99	10
5	VXH	D	506[B]	10/10	0.88	0.42	76,86,98,111	10
4	SO4	B	2403	5/5	0.89	0.34	114,133,167,181	0
4	SO4	C	502	5/5	0.89	0.26	115,121,145,153	0
5	VXH	A	2406	10/10	0.89	0.24	109,131,153,171	0
4	SO4	A	2403	5/5	0.90	0.17	120,123,156,156	0
4	SO4	B	2402	5/5	0.91	0.16	84,88,102,114	0
4	SO4	A	2402	5/5	0.91	0.22	96,104,114,125	0
4	SO4	D	503	5/5	0.91	0.16	97,118,144,166	0
4	SO4	A	2404	5/5	0.92	0.12	141,144,174,177	0
5	VXH	C	505	10/10	0.92	0.32	91,105,118,133	0
4	SO4	D	502	5/5	0.92	0.34	103,110,133,138	0
3	GOL	B	2401	6/6	0.92	0.22	73,86,90,96	0
5	VXH	A	2405	10/10	0.93	0.23	91,106,112,115	0
5	VXH	B	2406	10/10	0.93	0.24	106,125,132,143	0
4	SO4	D	501	5/5	0.94	0.11	115,121,133,135	0
5	VXH	B	2405	10/10	0.95	0.20	92,102,115,125	0
3	GOL	A	2401	6/6	0.95	0.20	79,81,86,88	0
4	SO4	C	501	5/5	0.96	0.28	97,108,112,126	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.

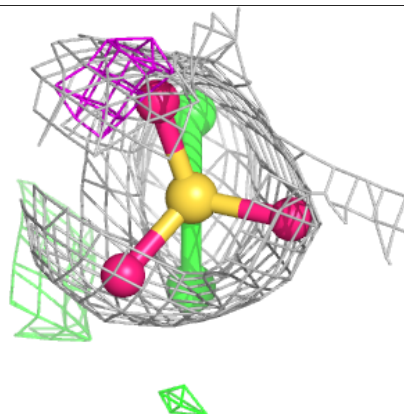
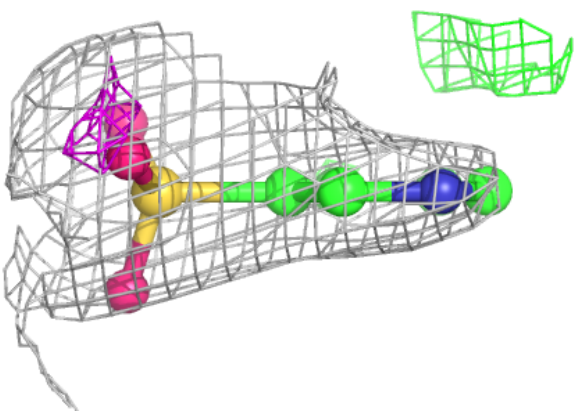
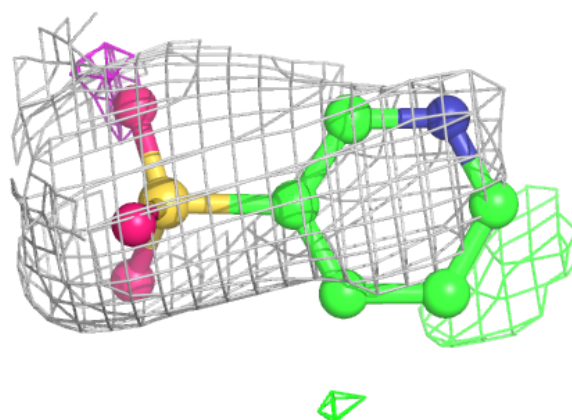
Electron density around VXH B 2407:

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

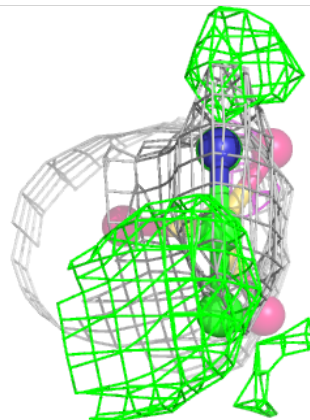
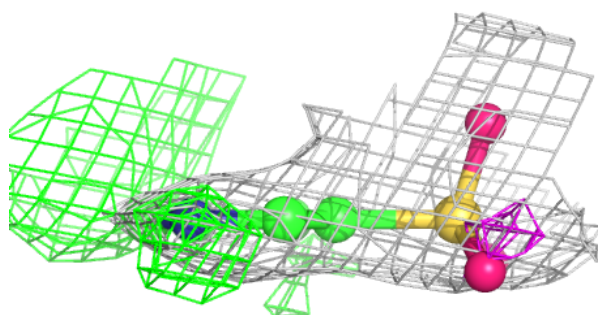
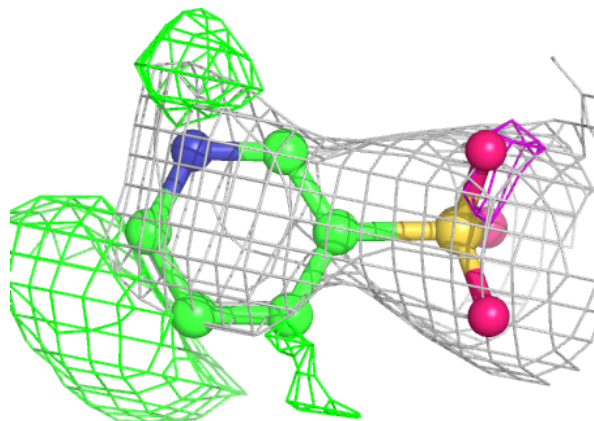


Electron density around VXH D 506 (A):

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

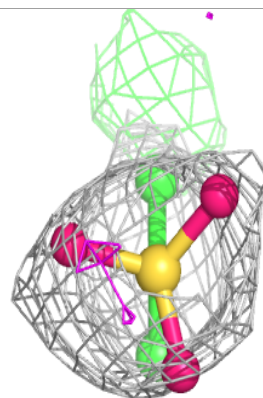
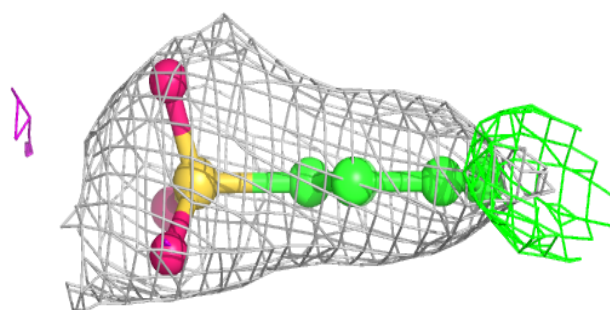
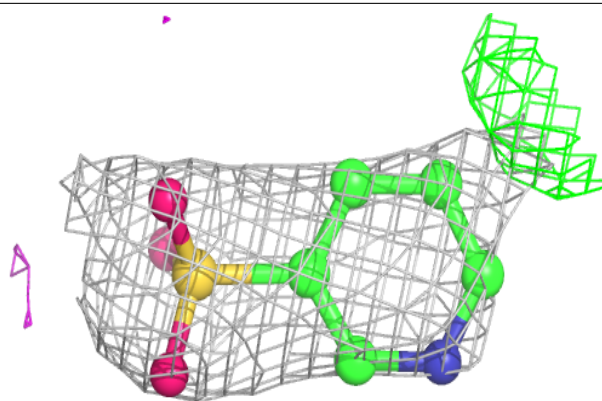
**Electron density around VXH D 506 (B):**

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

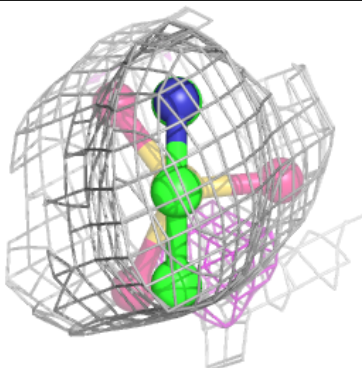
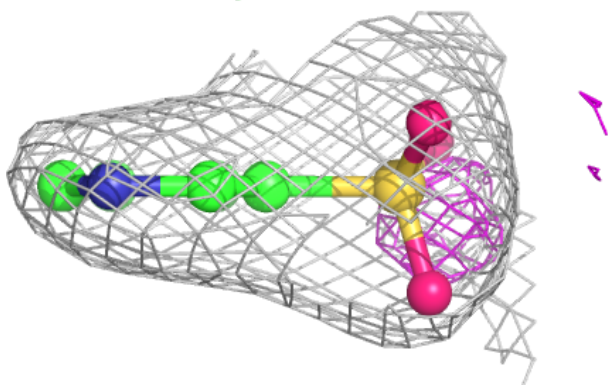
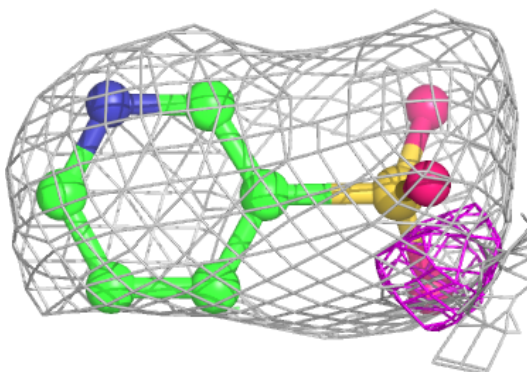


Electron density around VXH A 2406:

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

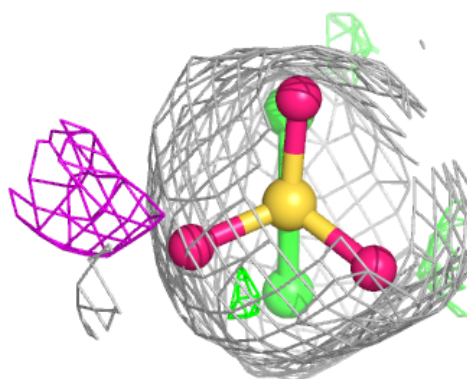
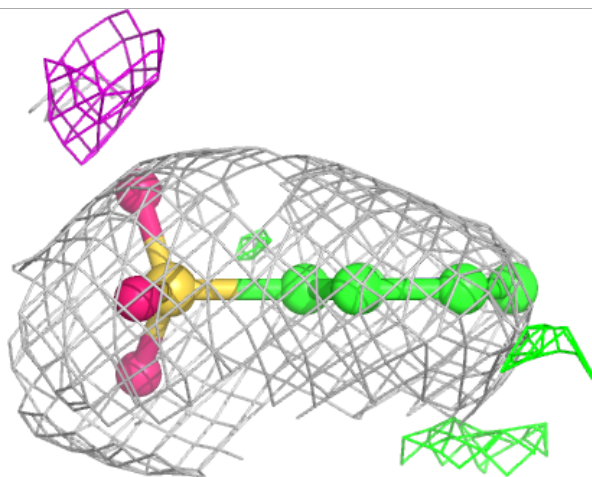
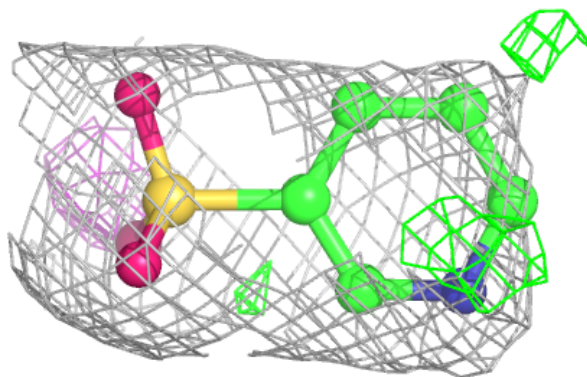
**Electron density around VXH C 505:**

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



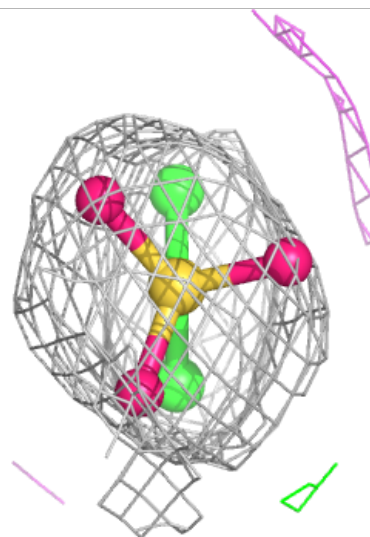
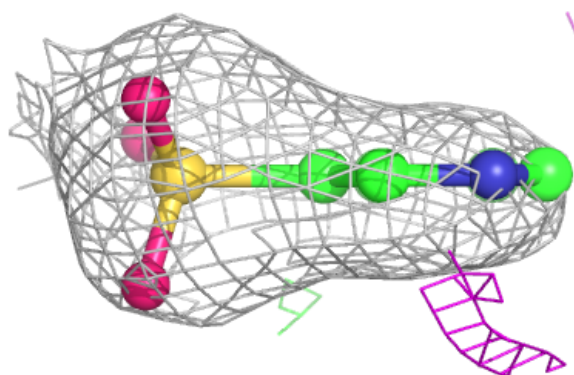
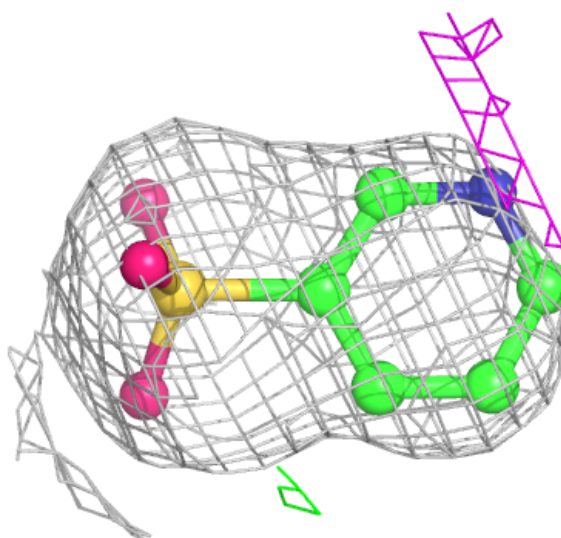
Electron density around VXH A 2405:

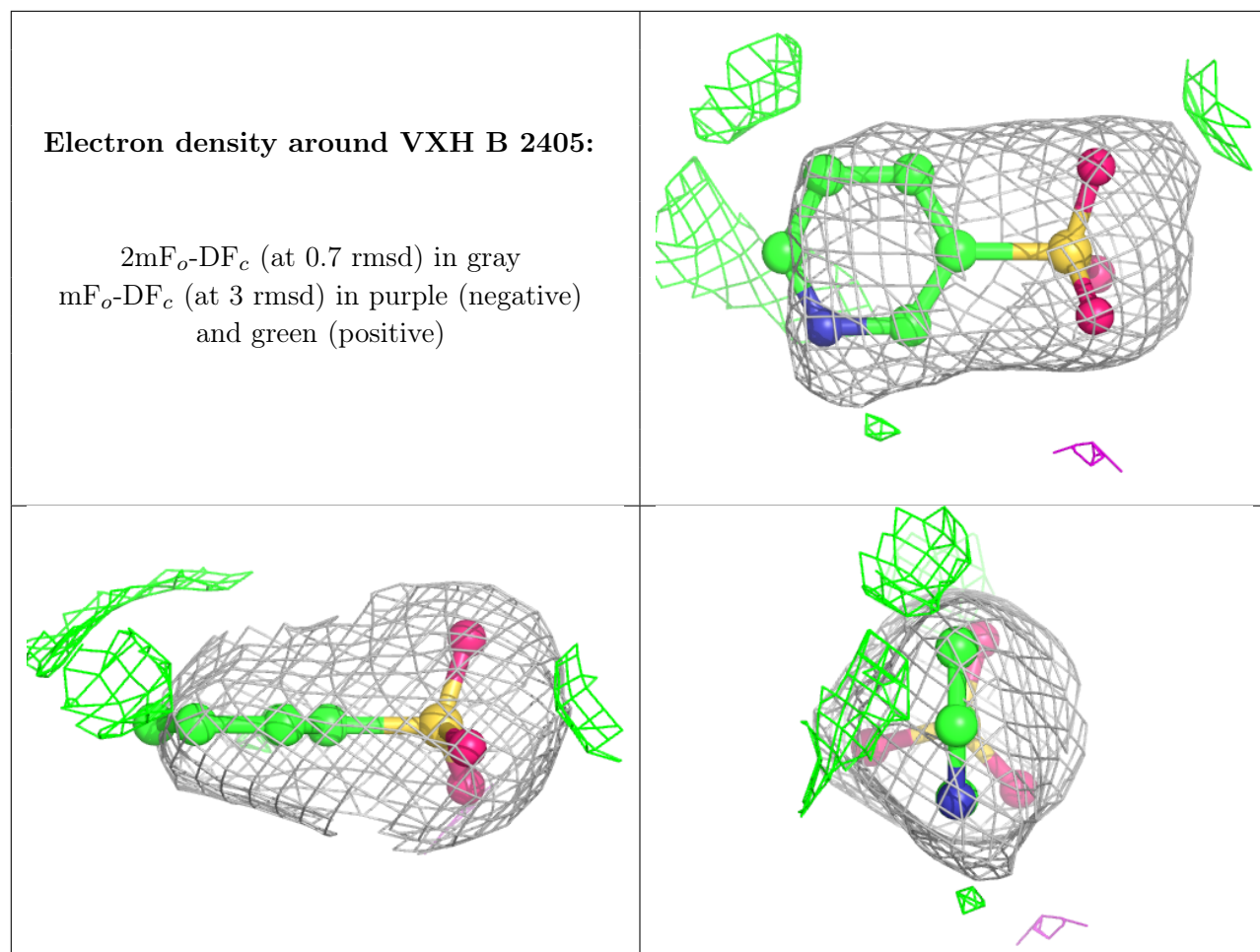
$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



Electron density around VXH B 2406:

$2mF_o-DF_c$ (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.