



# Full wwPDB X-ray Structure Validation Report ⓘ

Mar 17, 2026 – 06:45 PM UTC

PDB ID : 6PCD / pdb\_00006pcd  
Title : Crystal structure of beta-ketoadipyl-CoA thiolase mutant (C90S-H356A) in complex Octanoyl coenzyme A  
Authors : Sukritee, B.; Panjekar, S.  
Deposited on : 2019-06-17  
Resolution : 1.37 Å(reported)

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

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

A user guide is available at

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

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

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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)  
Xtrriage (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

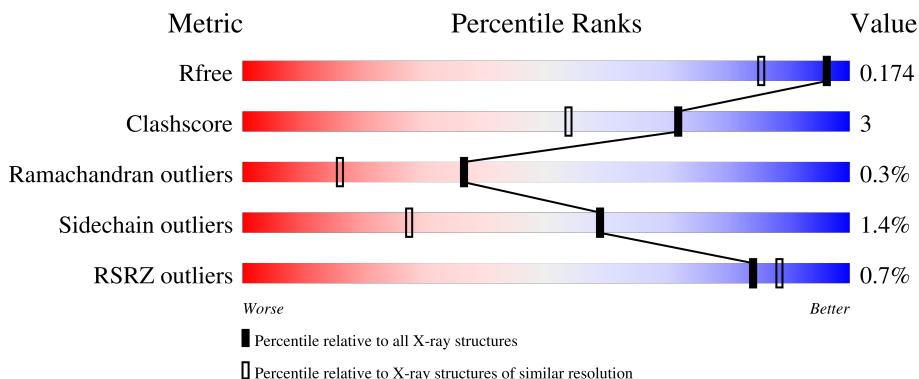
# 1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.37 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	4403 (1.40-1.36)
Clashscore	190562	4528 (1.40-1.36)
Ramachandran outliers	187476	4459 (1.40-1.36)
Sidechain outliers	187428	4458 (1.40-1.36)
RSRZ outliers	180081	4399 (1.40-1.36)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for  $\geq 3$ , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions  $\leq 5\%$ . The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	423	 89% 5% • 5%
1	B	423	 87% 6% 7%
1	C	423	 88% 5% 6%
1	D	423	 89% 6% 5%

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
3	OYA	A	502	-	-	X	-
3	OYA	B	501	-	-	X	-
3	OYA	D	502	-	-	X	-

## 2 Entry composition [i](#)

There are 7 unique types of molecules in this entry. The entry contains 13879 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 Beta-ketoacyl-CoA thiolase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	401	Total 3034	C 1888	N 547	O 580	S 19	0	14	0
1	B	394	Total 2949	C 1833	N 531	O 567	S 18	0	9	0
1	C	397	Total 2983	C 1858	N 534	O 573	S 18	0	11	0
1	D	402	Total 3013	C 1874	N 542	O 579	S 18	0	10	0

There are 100 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-22	MET	-	initiating methionine	UNP Q88N39
A	-21	HIS	-	expression tag	UNP Q88N39
A	-20	HIS	-	expression tag	UNP Q88N39
A	-19	HIS	-	expression tag	UNP Q88N39
A	-18	HIS	-	expression tag	UNP Q88N39
A	-17	HIS	-	expression tag	UNP Q88N39
A	-16	HIS	-	expression tag	UNP Q88N39
A	-15	SER	-	expression tag	UNP Q88N39
A	-14	SER	-	expression tag	UNP Q88N39
A	-13	GLY	-	expression tag	UNP Q88N39
A	-12	VAL	-	expression tag	UNP Q88N39
A	-11	ASP	-	expression tag	UNP Q88N39
A	-10	LEU	-	expression tag	UNP Q88N39
A	-9	GLY	-	expression tag	UNP Q88N39
A	-8	THR	-	expression tag	UNP Q88N39
A	-7	GLU	-	expression tag	UNP Q88N39
A	-6	ASN	-	expression tag	UNP Q88N39
A	-5	LEU	-	expression tag	UNP Q88N39
A	-4	TYR	-	expression tag	UNP Q88N39
A	-3	HIS	-	expression tag	UNP Q88N39
A	-2	GLN	-	expression tag	UNP Q88N39

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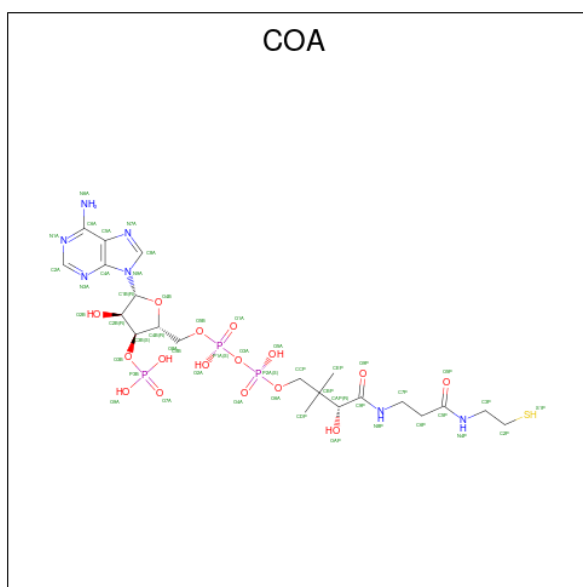
Chain	Residue	Modelled	Actual	Comment	Reference
A	-1	GLY	-	expression tag	UNP Q88N39
A	0	SER	-	expression tag	UNP Q88N39
A	90	SER	CYS	engineered mutation	UNP Q88N39
A	356	ALA	HIS	engineered mutation	UNP Q88N39
B	-22	MET	-	initiating methionine	UNP Q88N39
B	-21	HIS	-	expression tag	UNP Q88N39
B	-20	HIS	-	expression tag	UNP Q88N39
B	-19	HIS	-	expression tag	UNP Q88N39
B	-18	HIS	-	expression tag	UNP Q88N39
B	-17	HIS	-	expression tag	UNP Q88N39
B	-16	HIS	-	expression tag	UNP Q88N39
B	-15	SER	-	expression tag	UNP Q88N39
B	-14	SER	-	expression tag	UNP Q88N39
B	-13	GLY	-	expression tag	UNP Q88N39
B	-12	VAL	-	expression tag	UNP Q88N39
B	-11	ASP	-	expression tag	UNP Q88N39
B	-10	LEU	-	expression tag	UNP Q88N39
B	-9	GLY	-	expression tag	UNP Q88N39
B	-8	THR	-	expression tag	UNP Q88N39
B	-7	GLU	-	expression tag	UNP Q88N39
B	-6	ASN	-	expression tag	UNP Q88N39
B	-5	LEU	-	expression tag	UNP Q88N39
B	-4	TYR	-	expression tag	UNP Q88N39
B	-3	HIS	-	expression tag	UNP Q88N39
B	-2	GLN	-	expression tag	UNP Q88N39
B	-1	GLY	-	expression tag	UNP Q88N39
B	0	SER	-	expression tag	UNP Q88N39
B	90	SER	CYS	engineered mutation	UNP Q88N39
B	356	ALA	HIS	engineered mutation	UNP Q88N39
C	-22	MET	-	initiating methionine	UNP Q88N39
C	-21	HIS	-	expression tag	UNP Q88N39
C	-20	HIS	-	expression tag	UNP Q88N39
C	-19	HIS	-	expression tag	UNP Q88N39
C	-18	HIS	-	expression tag	UNP Q88N39
C	-17	HIS	-	expression tag	UNP Q88N39
C	-16	HIS	-	expression tag	UNP Q88N39
C	-15	SER	-	expression tag	UNP Q88N39
C	-14	SER	-	expression tag	UNP Q88N39
C	-13	GLY	-	expression tag	UNP Q88N39
C	-12	VAL	-	expression tag	UNP Q88N39
C	-11	ASP	-	expression tag	UNP Q88N39
C	-10	LEU	-	expression tag	UNP Q88N39

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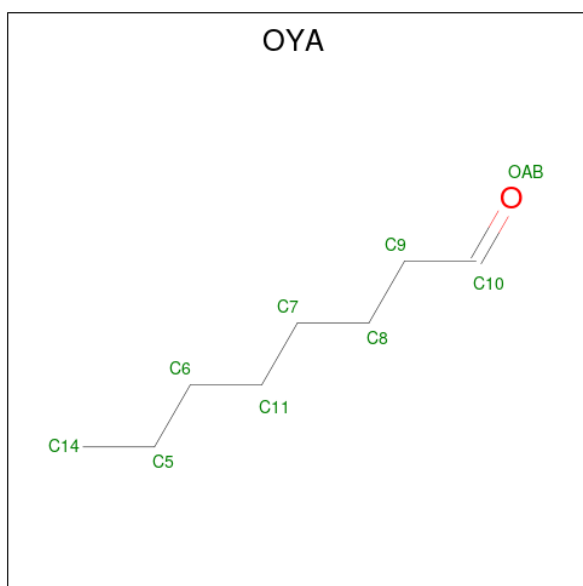
Chain	Residue	Modelled	Actual	Comment	Reference
C	-9	GLY	-	expression tag	UNP Q88N39
C	-8	THR	-	expression tag	UNP Q88N39
C	-7	GLU	-	expression tag	UNP Q88N39
C	-6	ASN	-	expression tag	UNP Q88N39
C	-5	LEU	-	expression tag	UNP Q88N39
C	-4	TYR	-	expression tag	UNP Q88N39
C	-3	HIS	-	expression tag	UNP Q88N39
C	-2	GLN	-	expression tag	UNP Q88N39
C	-1	GLY	-	expression tag	UNP Q88N39
C	0	SER	-	expression tag	UNP Q88N39
C	90	SER	CYS	engineered mutation	UNP Q88N39
C	356	ALA	HIS	engineered mutation	UNP Q88N39
D	-22	MET	-	initiating methionine	UNP Q88N39
D	-21	HIS	-	expression tag	UNP Q88N39
D	-20	HIS	-	expression tag	UNP Q88N39
D	-19	HIS	-	expression tag	UNP Q88N39
D	-18	HIS	-	expression tag	UNP Q88N39
D	-17	HIS	-	expression tag	UNP Q88N39
D	-16	HIS	-	expression tag	UNP Q88N39
D	-15	SER	-	expression tag	UNP Q88N39
D	-14	SER	-	expression tag	UNP Q88N39
D	-13	GLY	-	expression tag	UNP Q88N39
D	-12	VAL	-	expression tag	UNP Q88N39
D	-11	ASP	-	expression tag	UNP Q88N39
D	-10	LEU	-	expression tag	UNP Q88N39
D	-9	GLY	-	expression tag	UNP Q88N39
D	-8	THR	-	expression tag	UNP Q88N39
D	-7	GLU	-	expression tag	UNP Q88N39
D	-6	ASN	-	expression tag	UNP Q88N39
D	-5	LEU	-	expression tag	UNP Q88N39
D	-4	TYR	-	expression tag	UNP Q88N39
D	-3	HIS	-	expression tag	UNP Q88N39
D	-2	GLN	-	expression tag	UNP Q88N39
D	-1	GLY	-	expression tag	UNP Q88N39
D	0	SER	-	expression tag	UNP Q88N39
D	90	SER	CYS	engineered mutation	UNP Q88N39
D	356	ALA	HIS	engineered mutation	UNP Q88N39

- Molecule 2 is COENZYME A (CCD ID: COA) (formula: C<sub>21</sub>H<sub>36</sub>N<sub>7</sub>O<sub>16</sub>P<sub>3</sub>S).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	
			Total	C	N	O	P			S
2	A	1	48	21	7	16	3	1	0	0
2	D	1	48	21	7	16	3	1	0	0

- Molecule 3 is OCTANAL (CCD ID: OYA) (formula:  $C_8H_{16}O$ ) (labeled as "Ligand of Interest" by depositor).



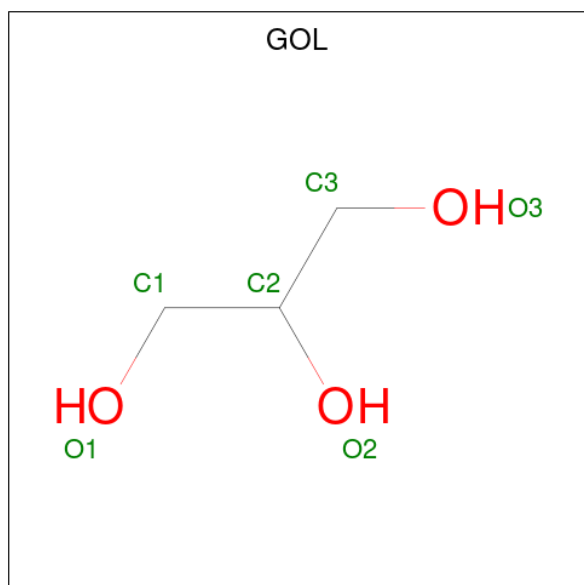
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf	
			Total	C			O
3	A	1	9	8	1	0	0

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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	B	1	Total	C	O	0	0
			9	8	1		
3	D	1	Total	C	O	0	0
			9	8	1		

- Molecule 4 is GLYCEROL (CCD ID: GOL) (formula: C<sub>3</sub>H<sub>8</sub>O<sub>3</sub>).



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

- Molecule 5 is CHLORIDE ION (CCD ID: CL) (formula: Cl).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	1	Total	Cl	0	0
			1	1		
5	B	2	Total	Cl	0	0
			2	2		

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Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	C	1	Total Cl 1 1	0	0
5	D	1	Total Cl 1 1	0	0

- Molecule 6 is POTASSIUM ION (CCD ID: K) (formula: K).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	B	1	Total K 1 1	0	0
6	C	2	Total K 2 2	0	0

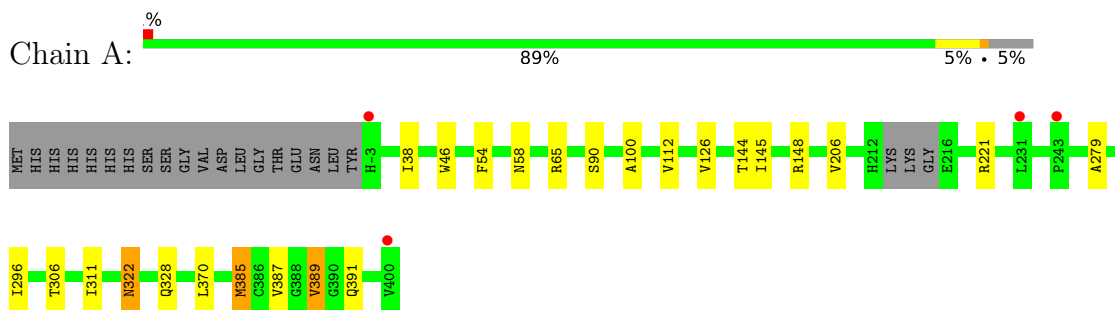
- Molecule 7 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
7	A	381	Total O 381 381	0	0
7	B	413	Total O 413 413	0	0
7	C	482	Total O 482 482	0	0
7	D	463	Total O 463 463	0	0

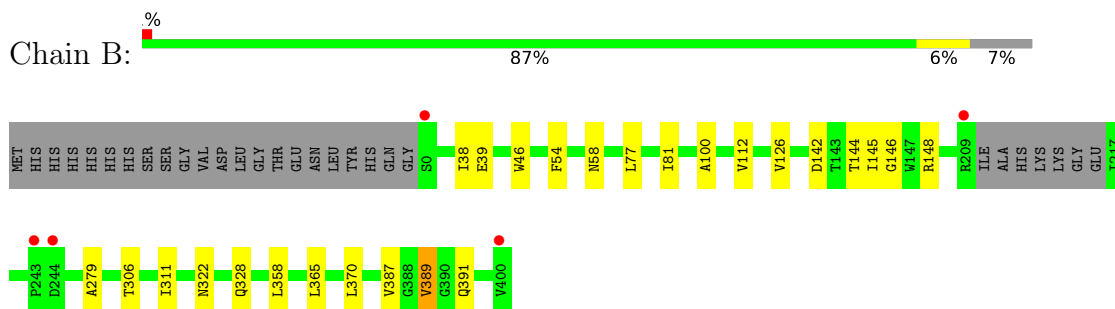
### 3 Residue-property plots [i](#)

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.

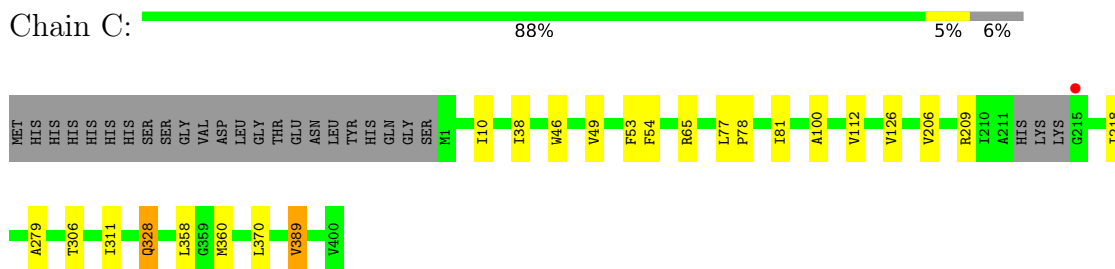
- Molecule 1: Beta-ketoadipyl-CoA thiolase



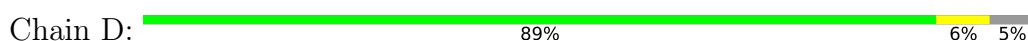
- Molecule 1: Beta-ketoadipyl-CoA thiolase

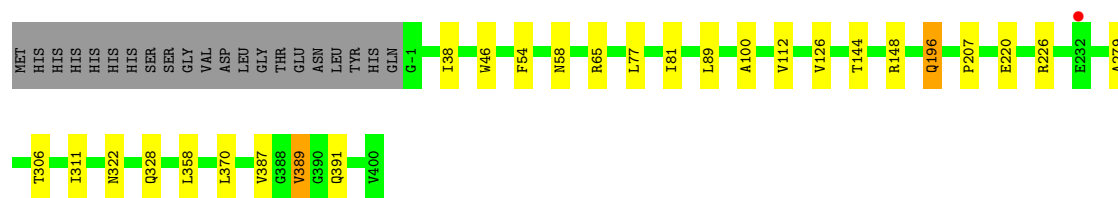


- Molecule 1: Beta-ketoadipyl-CoA thiolase



- Molecule 1: Beta-ketoadipyl-CoA thiolase





## 4 Data and refinement statistics i

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	111.08Å 116.62Å 128.56Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	19.99 – 1.37 19.99 – 1.37	Depositor EDS
% Data completeness (in resolution range)	99.6 (19.99-1.37) 99.6 (19.99-1.37)	Depositor EDS
$R_{merge}$	0.06	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.27 (at 1.37Å)	Xtrriage
Refinement program	REFMAC 5.8.0253	Depositor
R, $R_{free}$	0.140 , 0.172 0.140 , 0.174	Depositor DCC
$R_{free}$ test set	938 reflections (0.27%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	12.4	Xtrriage
Anisotropy	0.081	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.37 , 52.0	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.50$ , $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	0.009 for k,h,-l	Xtrriage
$F_o, F_c$ correlation	0.98	EDS
Total number of atoms	13879	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	21.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.95% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical values of  $\langle |L| \rangle$ ,  $\langle L^2 \rangle$  for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

## 5 Model quality [i](#)

### 5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: OYA, K, CL, GOL, COA

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	0.58	0/3082	0.86	2/4173 (0.0%)
1	B	0.60	0/2989	0.87	2/4043 (0.0%)
1	C	0.60	0/3026	0.88	1/4096 (0.0%)
1	D	0.60	0/3055	0.86	1/4134 (0.0%)
All	All	0.60	0/12152	0.87	6/16446 (0.0%)

There are no bond length outliers.

All (6) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	D	196	GLN	CB-CG-CD	-5.76	102.81	112.60
1	B	39	GLU	CB-CG-CD	5.64	122.20	112.60
1	A	296	ILE	CA-C-N	5.31	125.01	121.13
1	A	296	ILE	C-N-CA	5.31	125.01	121.13
1	B	142	ASP	CA-CB-CG	5.13	117.73	112.60
1	C	328	GLN	CB-CG-CD	5.01	121.12	112.60

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	3034	0	3061	20	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	B	2949	0	2971	16	0
1	C	2983	0	3009	23	0
1	D	3013	0	3038	21	0
2	A	48	0	32	0	0
2	D	48	0	32	1	0
3	A	9	0	16	12	0
3	B	9	0	16	14	0
3	D	9	0	16	11	0
4	A	6	0	8	0	0
4	B	6	0	8	0	0
4	C	12	0	16	2	0
4	D	6	0	8	0	0
5	A	1	0	0	0	0
5	B	2	0	0	0	0
5	C	1	0	0	0	0
5	D	1	0	0	0	0
6	B	1	0	0	0	0
6	C	2	0	0	0	0
7	A	381	0	0	2	0
7	B	413	0	0	1	0
7	C	482	0	0	0	0
7	D	463	0	0	1	0
All	All	13879	0	12231	80	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 (80) 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)
3:A:502:OYA:H91	1:D:65:ARG:HE	1.23	0.99
1:D:148:ARG:HH22	3:D:502:OYA:H72	1.33	0.91
1:B:148:ARG:HH22	3:B:501:OYA:H72	1.43	0.83
1:C:10:ILE:CG1	1:C:206:VAL:HG13	2.08	0.82
1:C:10:ILE:HG12	1:C:206:VAL:HG13	1.61	0.82
1:A:65:ARG:HE	3:D:502:OYA:H91	1.45	0.81
3:B:501:OYA:H91	1:C:65:ARG:HE	1.46	0.81
1:A:148:ARG:HH22	3:A:502:OYA:H72	1.46	0.80
3:A:502:OYA:H91	1:D:65:ARG:NE	1.98	0.78
1:B:144:THR:O	3:B:501:OYA:H142	1.86	0.75
1:C:10:ILE:HG12	1:C:206:VAL:CG1	2.15	0.74

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:144:THR:O	3:A:502:OYA:H142	1.95	0.67
1:B:58:ASN:HD22	3:B:501:OYA:H143	1.60	0.65
1:D:144:THR:O	3:D:502:OYA:H142	1.98	0.62
3:A:502:OYA:H143	7:A:880:HOH:O	1.99	0.62
3:B:501:OYA:H91	1:C:65:ARG:NE	2.15	0.62
1:C:49:VAL:HB	1:C:81[A]:ILE:HD13	1.81	0.61
1:A:126:VAL:HG12	1:D:126:VAL:HG12	1.84	0.59
3:A:502:OYA:H71	1:D:65:ARG:HG2	1.82	0.59
1:B:148:ARG:NH2	3:B:501:OYA:H72	2.17	0.59
1:A:65:ARG:NE	3:D:502:OYA:H91	2.17	0.58
1:D:207:PRO:HB3	1:D:220:GLU:HG2	1.84	0.58
3:D:502:OYA:H143	7:D:916:HOH:O	2.02	0.58
3:B:501:OYA:H71	1:C:65:ARG:HG2	1.86	0.58
1:B:145:ILE:HA	3:B:501:OYA:H81	1.86	0.58
1:B:306:THR:HB	1:B:311:ILE:O	2.05	0.57
3:A:502:OYA:H71	1:D:65:ARG:CD	2.34	0.57
1:D:148:ARG:NH2	3:D:502:OYA:H72	2.13	0.56
1:A:100:ALA:HB1	1:A:112[A]:VAL:HG21	1.88	0.56
1:D:306:THR:HB	1:D:311:ILE:O	2.07	0.55
1:A:306:THR:HB	1:A:311:ILE:O	2.08	0.54
3:A:502:OYA:H71	1:D:65:ARG:CG	2.37	0.54
1:C:100:ALA:HB1	1:C:112[A]:VAL:HG21	1.90	0.54
1:C:38:ILE:HA	1:C:46:TRP:CZ2	2.44	0.53
1:D:100:ALA:HB1	1:D:112:VAL:HG21	1.91	0.52
1:B:126:VAL:HG12	1:C:126:VAL:HG12	1.92	0.52
1:B:100:ALA:HB1	1:B:112:VAL:HG21	1.92	0.52
1:D:38:ILE:HA	1:D:46:TRP:CZ2	2.44	0.52
1:D:279:ALA:HB2	1:D:370:LEU:HD13	1.93	0.51
1:D:58:ASN:HD22	3:D:502:OYA:H143	1.75	0.51
1:C:279:ALA:HB2	1:C:370:LEU:HD13	1.92	0.51
1:A:38:ILE:HA	1:A:46:TRP:CZ2	2.45	0.50
1:A:65:ARG:HG2	3:D:502:OYA:H71	1.93	0.50
1:C:358:LEU:HD12	4:C:502:GOL:H31	1.93	0.49
1:A:206[A]:VAL:HG22	7:A:625:HOH:O	2.12	0.49
1:B:38:ILE:HA	1:B:46:TRP:CZ2	2.49	0.48
1:A:58:ASN:HD22	3:A:502:OYA:H143	1.79	0.47
1:C:78:PRO:HD2	1:C:81[B]:ILE:CD1	2.44	0.47
1:C:209:ARG:HG2	1:C:218:ILE:HD12	1.95	0.47
1:A:145:ILE:HG13	3:A:502:OYA:H81	1.96	0.47
1:B:387:VAL:HB	1:B:391:GLN:HB2	1.97	0.47
1:A:148:ARG:NH2	3:A:502:OYA:H72	2.23	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:A:502:OYA:H71	1:D:65:ARG:HD2	1.98	0.46
1:B:146:GLY:H	3:B:501:OYA:H81	1.80	0.46
1:C:306:THR:HB	1:C:311:ILE:O	2.15	0.46
1:A:65:ARG:CD	3:D:502:OYA:H71	2.46	0.45
1:C:77:LEU:HB3	1:C:81[A]:ILE:HD12	1.97	0.45
1:B:279:ALA:HB2	1:B:370:LEU:HD13	1.99	0.45
1:C:10:ILE:HG12	1:C:206:VAL:HG11	1.96	0.45
3:B:501:OYA:H71	1:C:65:ARG:CD	2.47	0.45
3:B:501:OYA:H71	1:C:65:ARG:CG	2.47	0.45
1:A:279:ALA:HB2	1:A:370:LEU:HD13	1.99	0.44
3:B:501:OYA:H143	7:B:875:HOH:O	2.17	0.44
1:D:226:ARG:NH1	2:D:501:COA:O2A	2.51	0.44
1:D:358:LEU:CD1	3:D:502:OYA:H82	2.46	0.44
1:C:53:PHE:CE1	1:C:112[B]:VAL:HG11	2.53	0.44
1:A:65:ARG:CG	3:D:502:OYA:H71	2.48	0.44
1:C:360[A]:MET:O	1:C:360[A]:MET:HG2	2.17	0.43
1:C:78:PRO:HD2	1:C:81[B]:ILE:HD12	2.01	0.43
1:C:358:LEU:CD1	4:C:502:GOL:H31	2.48	0.43
1:A:65:ARG:HA	1:D:89:LEU:HD21	2.00	0.43
1:B:358:LEU:HD11	3:B:501:OYA:H82	2.01	0.43
1:D:77:LEU:HB3	1:D:81[B]:ILE:HD12	2.02	0.42
1:A:387:VAL:HB	1:A:391:GLN:HB2	2.01	0.42
1:B:358:LEU:CD1	3:B:501:OYA:H82	2.49	0.42
1:A:90[A]:SER:O	1:A:385[A]:MET:HE2	2.21	0.41
1:D:387:VAL:HB	1:D:391:GLN:HB2	2.02	0.41
1:A:322:ASN:HB3	1:A:385[B]:MET:CB	2.51	0.40
1:B:77:LEU:HB3	1:B:81:ILE:HD12	2.03	0.40
1:B:322:ASN:HB2	1:B:365:LEU:HD11	2.04	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	411/423 (97%)	401 (98%)	9 (2%)	1 (0%)	43 19
1	B	399/423 (94%)	387 (97%)	11 (3%)	1 (0%)	36 16
1	C	404/423 (96%)	390 (96%)	13 (3%)	1 (0%)	43 19
1	D	410/423 (97%)	400 (98%)	9 (2%)	1 (0%)	43 19
All	All	1624/1692 (96%)	1578 (97%)	42 (3%)	4 (0%)	36 19

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	389	VAL
1	D	389	VAL
1	A	389	VAL
1	C	389	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	A	311/316 (98%)	304 (98%)	7 (2%)	44 13
1	B	301/316 (95%)	298 (99%)	3 (1%)	68 40
1	C	304/316 (96%)	301 (99%)	3 (1%)	68 40
1	D	307/316 (97%)	302 (98%)	5 (2%)	55 22
All	All	1223/1264 (97%)	1205 (98%)	18 (2%)	59 25

All (18) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	54	PHE
1	A	221	ARG
1	A	322	ASN
1	A	328	GLN
1	A	385[A]	MET
1	A	385[B]	MET
1	A	389	VAL

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Mol	Chain	Res	Type
1	B	54	PHE
1	B	328	GLN
1	B	389	VAL
1	C	54	PHE
1	C	328	GLN
1	C	389	VAL
1	D	54	PHE
1	D	196	GLN
1	D	322	ASN
1	D	328	GLN
1	D	389	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (8) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	66	ASN
1	A	196	GLN
1	A	241	ASN
1	B	45	GLN
1	B	66	ASN
1	B	137	ASN
1	B	175	GLN
1	C	66	ASN

### 5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

### 5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

### 5.6 Ligand geometry [i](#)

Of 18 ligands modelled in this entry, 8 are monoatomic - leaving 10 for Mogul analysis.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with  $|Z| > 2$  is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
2	COA	D	501	-	47,50,50	0.51	0	69,75,75	1.01	3 (4%)
4	GOL	C	501	-	5,5,5	0.18	0	5,5,5	0.27	0
3	OYA	B	501	-	7,8,8	0.48	0	6,7,7	0.34	0
3	OYA	D	502	-	7,8,8	0.27	0	6,7,7	0.46	0
4	GOL	C	502	-	5,5,5	0.17	0	5,5,5	0.65	0
4	GOL	D	503	-	5,5,5	0.11	0	5,5,5	0.30	0
3	OYA	A	502	-	7,8,8	0.51	0	6,7,7	0.42	0
4	GOL	A	503	-	5,5,5	0.08	0	5,5,5	0.27	0
2	COA	A	501	-	47,50,50	0.61	0	69,75,75	0.91	1 (1%)
4	GOL	B	502	-	5,5,5	0.08	0	5,5,5	0.31	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	COA	D	501	-	-	3/48/64/64	0/3/3/3
4	GOL	C	501	-	-	0/4/4/4	-
3	OYA	B	501	-	-	4/6/6/6	-
3	OYA	D	502	-	-	4/6/6/6	-
4	GOL	C	502	-	-	4/4/4/4	-
4	GOL	D	503	-	-	0/4/4/4	-
3	OYA	A	502	-	-	4/6/6/6	-
4	GOL	A	503	-	-	0/4/4/4	-
2	COA	A	501	-	-	4/48/64/64	0/3/3/3
4	GOL	B	502	-	-	0/4/4/4	-

There are no bond length outliers.

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	D	501	COA	P3B-O3B-C3B	-4.83	110.53	123.43
2	A	501	COA	P3B-O3B-C3B	-4.63	111.08	123.43
2	D	501	COA	O6A-CCP-CBP	-2.91	105.86	110.55
2	D	501	COA	C7P-C6P-C5P	2.27	116.17	112.39

There are no chirality outliers.

All (23) torsion outliers are listed below:

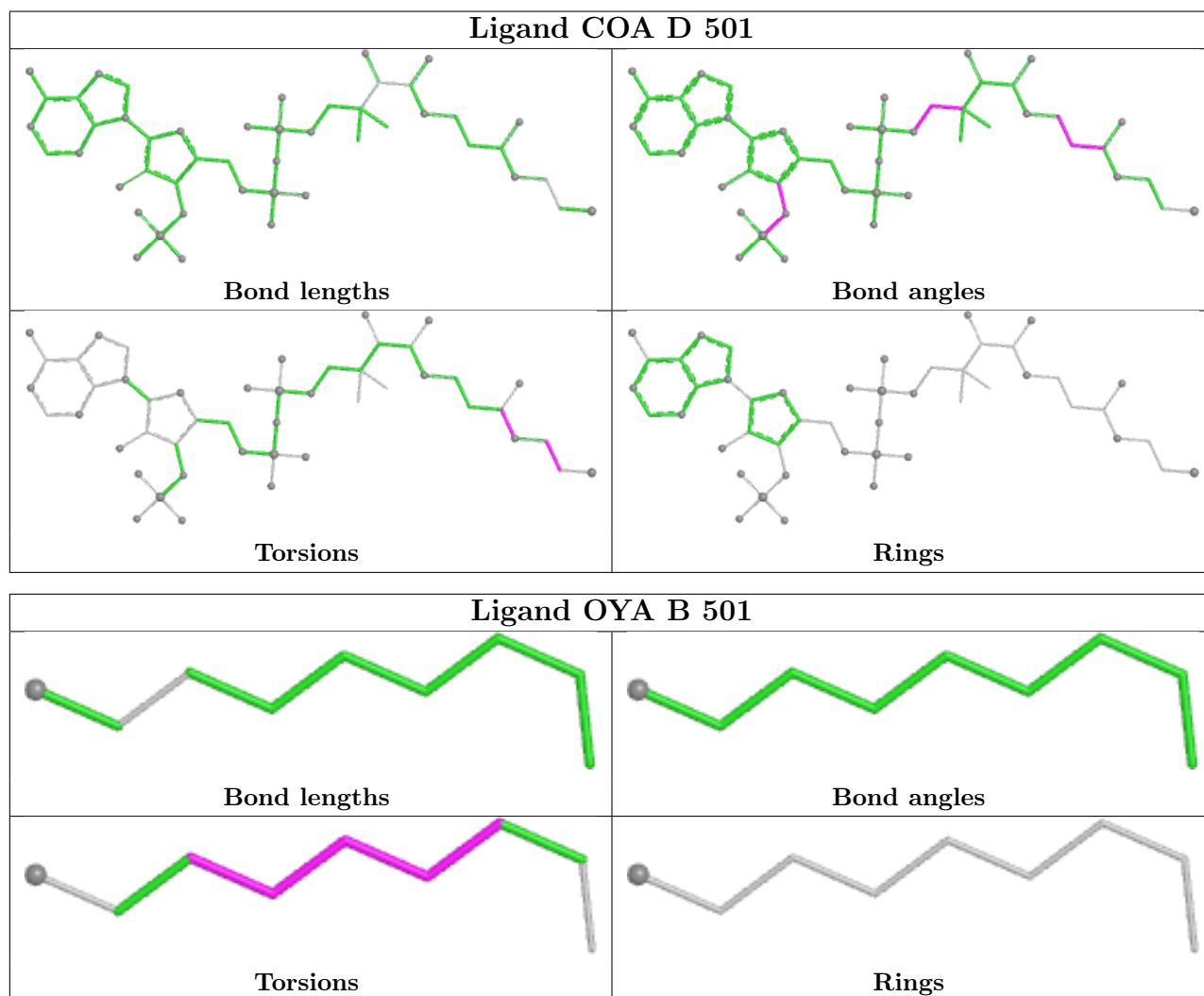
Mol	Chain	Res	Type	Atoms
2	D	501	COA	C6P-C5P-N4P-C3P
2	D	501	COA	O5P-C5P-N4P-C3P
4	C	502	GOL	C1-C2-C3-O3
2	A	501	COA	C6P-C5P-N4P-C3P
2	A	501	COA	O5P-C5P-N4P-C3P
4	C	502	GOL	O1-C1-C2-C3
3	B	501	OYA	C7-C11-C6-C5
3	D	502	OYA	C7-C11-C6-C5
3	A	502	OYA	C7-C11-C6-C5
3	A	502	OYA	C6-C11-C7-C8
4	C	502	GOL	O1-C1-C2-O2
4	C	502	GOL	O2-C2-C3-O3
3	D	502	OYA	C6-C11-C7-C8
3	B	501	OYA	C11-C7-C8-C9
2	A	501	COA	P2A-O3A-P1A-O1A
3	B	501	OYA	C6-C11-C7-C8
3	A	502	OYA	C7-C8-C9-C10
3	B	501	OYA	C7-C8-C9-C10
3	D	502	OYA	C7-C8-C9-C10
3	D	502	OYA	C11-C7-C8-C9
2	A	501	COA	P2A-O3A-P1A-O2A
3	A	502	OYA	C11-C7-C8-C9
2	D	501	COA	S1P-C2P-C3P-N4P

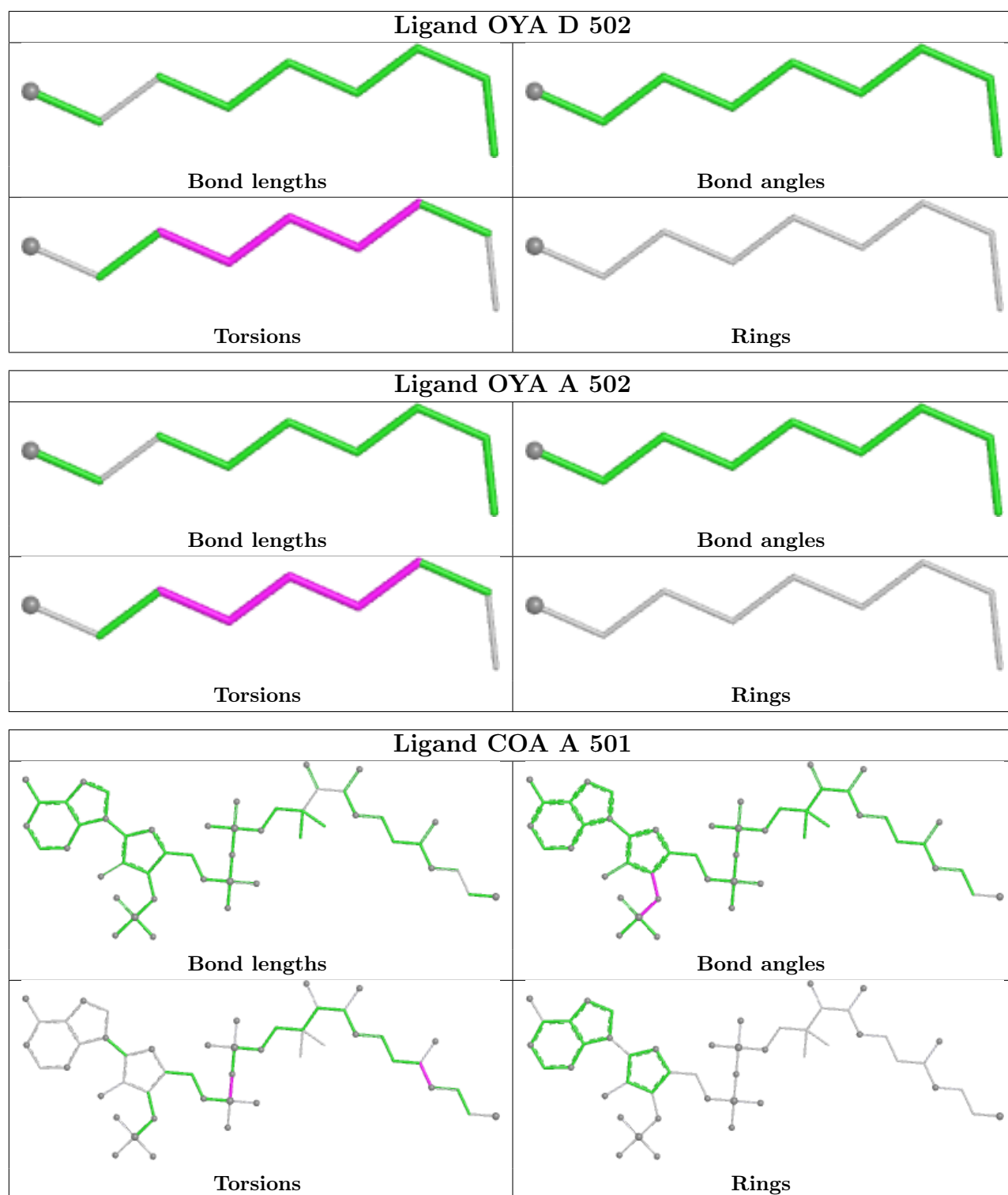
There are no ring outliers.

5 monomers are involved in 40 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	D	501	COA	1	0
3	B	501	OYA	14	0
3	D	502	OYA	11	0
4	C	502	GOL	2	0
3	A	502	OYA	12	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

There are no chain breaks in this entry.

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

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

In the following table, the column labelled ‘#RSRZ> 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95<sup>th</sup> percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q< 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å <sup>2</sup> )	Q<0.9
1	A	401/423 (94%)	-0.30	4 (0%) 79 85	8, 20, 34, 44	16 (3%)
1	B	394/423 (93%)	-0.40	5 (1%) 75 81	8, 18, 30, 52	11 (2%)
1	C	397/423 (93%)	-0.48	1 (0%) 90 93	7, 17, 28, 41	13 (3%)
1	D	402/423 (95%)	-0.47	1 (0%) 91 93	8, 17, 27, 47	13 (3%)
All	All	1594/1692 (94%)	-0.41	11 (0%) 84 88	7, 18, 30, 52	53 (3%)

All (11) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	400	VAL	4.3
1	B	243	PRO	4.2
1	C	215	GLY	2.9
1	A	-3	HIS	2.6
1	A	400	VAL	2.6
1	A	243	PRO	2.4
1	A	231	LEU	2.3
1	B	244	ASP	2.2
1	B	209	ARG	2.1
1	B	0	SER	2.1
1	D	232	GLU	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

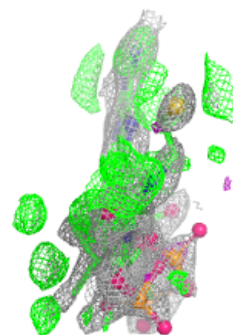
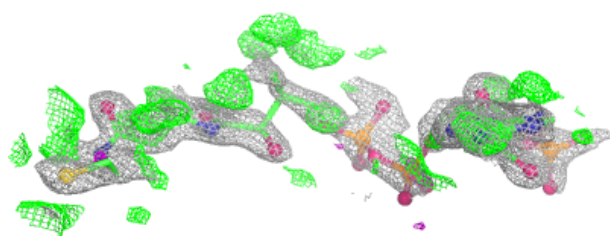
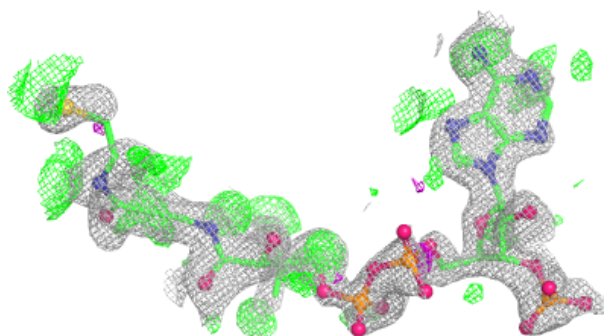
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95<sup>th</sup> percentile and maximum values of B factors of atoms in the group. The column labelled 'Q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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å <sup>2</sup> )	Q<0.9
2	COA	D	501	48/48	0.83	0.17	16,31,44,51	48
6	K	C	505	1/1	0.85	0.19	57,57,57,57	1
3	OYA	A	502	9/9	0.88	0.15	18,27,36,38	0
3	OYA	D	502	9/9	0.88	0.14	16,27,34,41	0
2	COA	A	501	48/48	0.88	0.14	19,28,46,52	48
3	OYA	B	501	9/9	0.91	0.13	15,25,32,39	1
6	K	B	505	1/1	0.94	0.26	36,36,36,36	1
4	GOL	C	502	6/6	0.96	0.10	20,32,35,36	0
5	CL	B	504	1/1	0.97	0.08	35,35,35,35	0
4	GOL	B	502	6/6	0.98	0.04	20,21,23,23	0
4	GOL	A	503	6/6	0.98	0.05	22,23,24,24	0
4	GOL	D	503	6/6	0.98	0.05	18,19,20,20	0
6	K	C	504	1/1	0.99	0.15	34,34,34,34	1
4	GOL	C	501	6/6	0.99	0.04	16,17,17,18	0
5	CL	D	504	1/1	1.00	0.07	19,19,19,19	0
5	CL	B	503	1/1	1.00	0.06	21,21,21,21	0
5	CL	A	504	1/1	1.00	0.03	19,19,19,19	1
5	CL	C	503	1/1	1.00	0.07	18,18,18,18	0

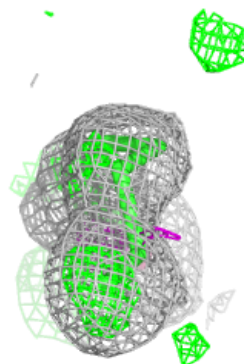
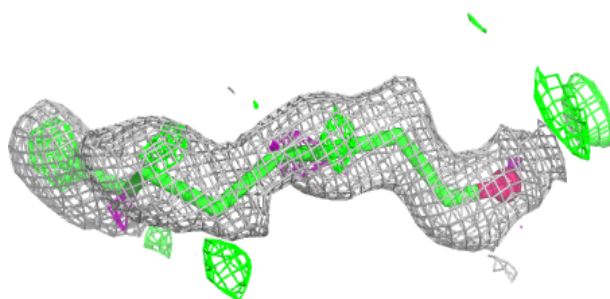
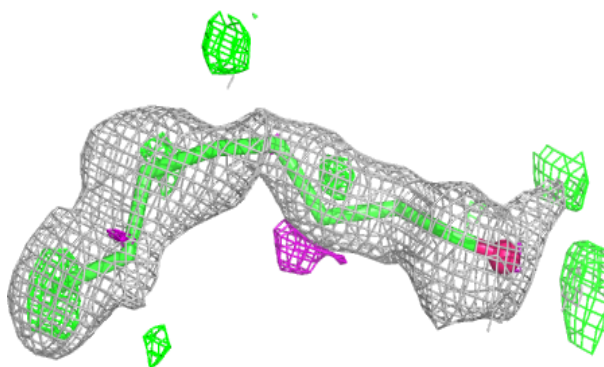
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

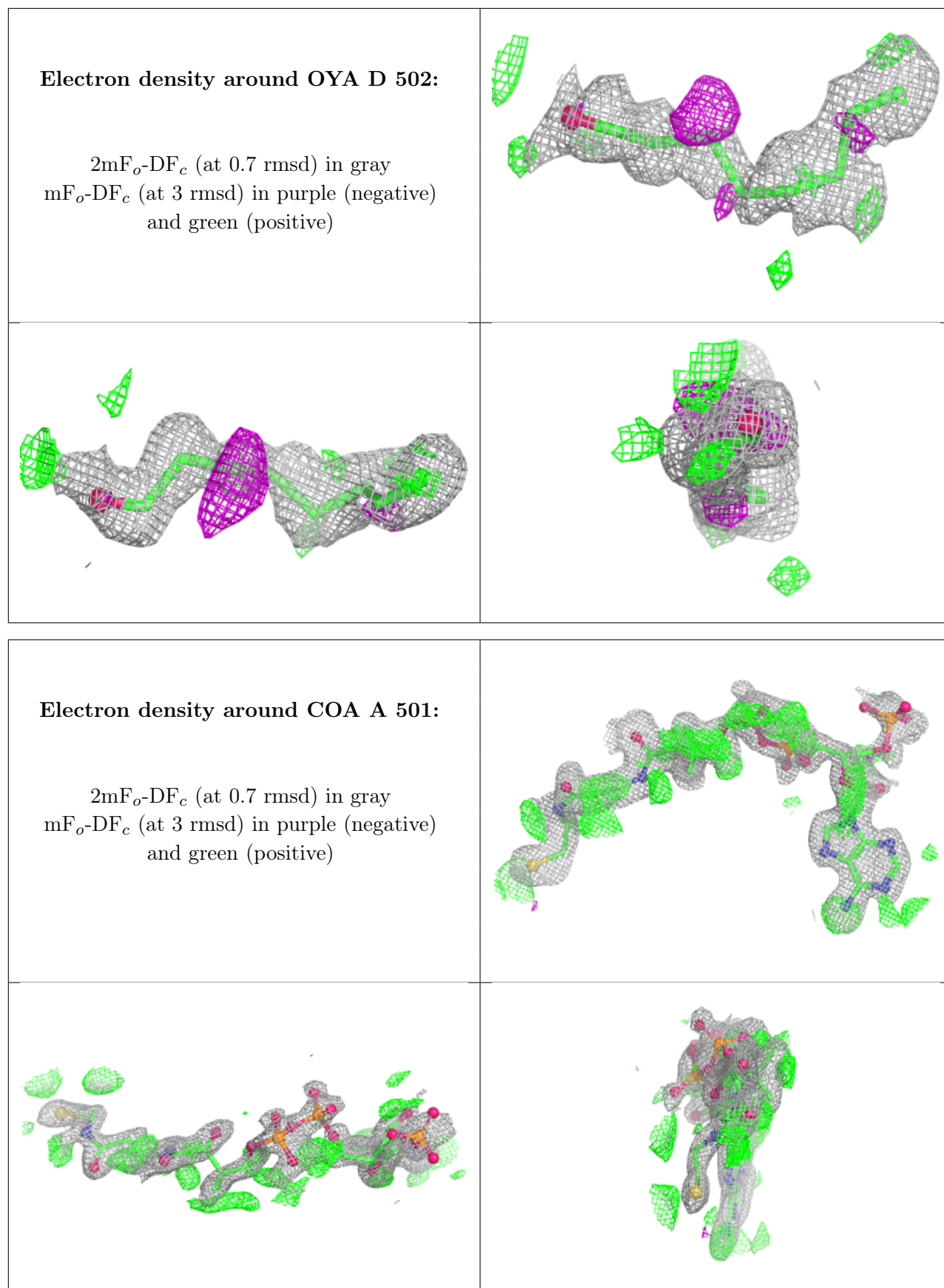
**Electron density around COA D 501:**

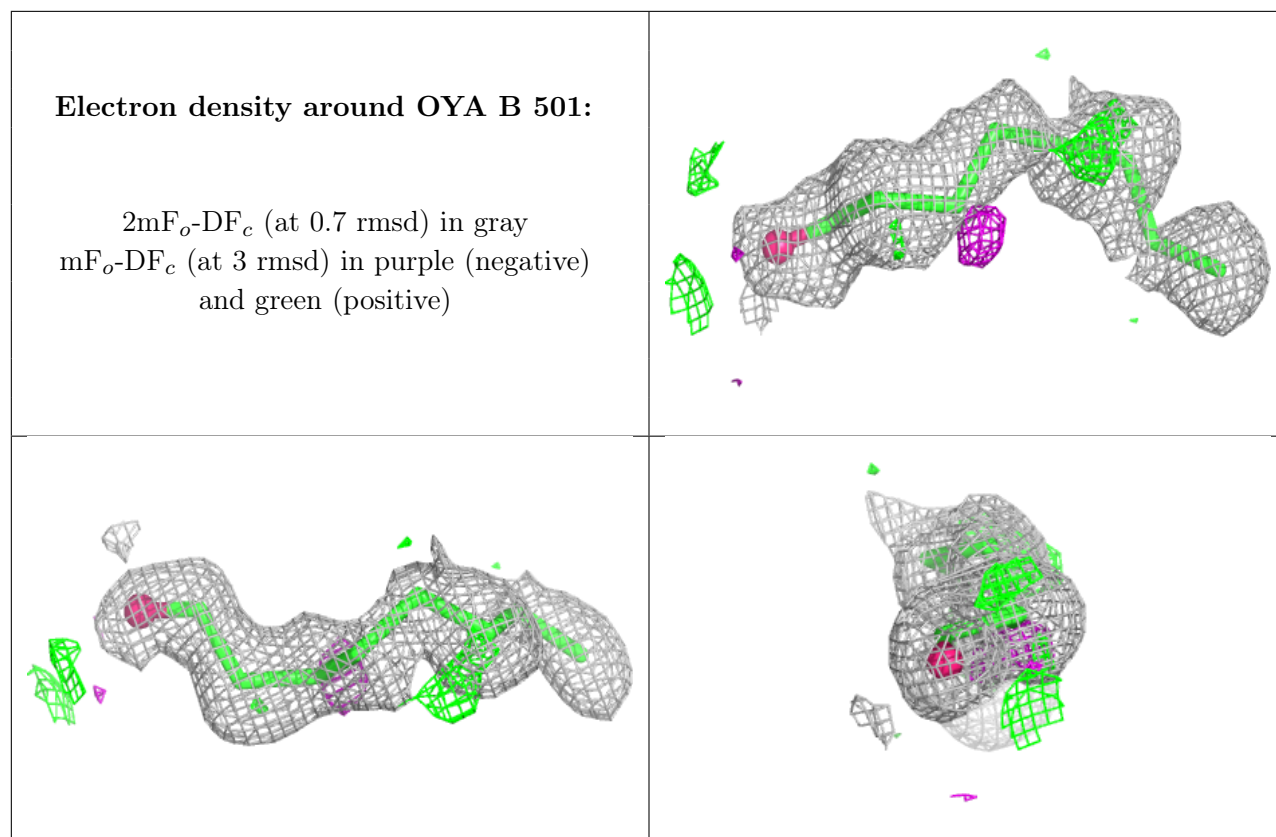
$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)

**Electron density around OYA A 502:**

$2mF_o-DF_c$  (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.