



wwPDB X-ray Structure Validation Summary Report ⓘ

May 22, 2020 – 05:10 pm BST

PDB ID : 4R87
Title : Crystal structure of spermidine N-acetyltransferase from *Vibrio cholerae* in complex with CoA and spermine
Authors : Filippova, E.V.; Minasov, G.; Kiryukhina, O.; Kuhn, M.L.; Anderson, W.F.; Center for Structural Genomics of Infectious Diseases (CSGID)
Deposited on : 2014-08-29
Resolution : 2.61 Å(reported)

This is a wwPDB X-ray Structure Validation Summary 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 following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4.02b-467
Mogul : 1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix) : 1.13
EDS : 2.11
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) : 2.11

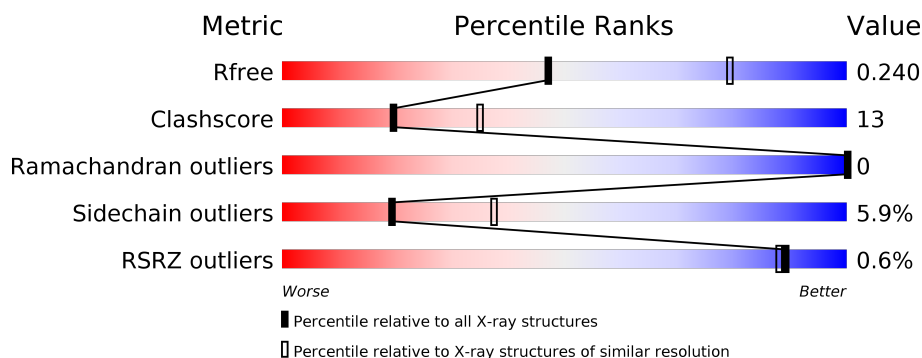
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.61 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	3797 (2.64-2.60)
Clashscore	141614	4168 (2.64-2.60)
Ramachandran outliers	138981	4093 (2.64-2.60)
Sidechain outliers	138945	4093 (2.64-2.60)
RSRZ outliers	127900	3731 (2.64-2.60)

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 on 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	176	<div> <div>2%</div> <div>64%</div> <div>31%</div> <div>• •</div> </div>
1	B	176	<div> <div>61%</div> <div>34%</div> <div>• •</div> </div>
1	C	176	<div> <div>%</div> <div>68%</div> <div>26%</div> <div>• •</div> </div>
1	D	176	<div> <div>2%</div> <div>61%</div> <div>32%</div> <div>• 5%</div> </div>
1	E	176	<div> <div>61%</div> <div>32%</div> <div>• •</div> </div>
1	F	176	<div> <div>%</div> <div>68%</div> <div>27%</div> <div>• •</div> </div>

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Mol	Chain	Length	Quality of chain
1	G	176	<div><div></div><div>65%30%<div><div></div><div></div></div></div></div>
1	H	176	<div>%<div><div></div><div>72%23%<div><div></div><div></div></div></div></div></div>
1	I	176	<div><div></div><div>66%27%<div><div></div><div></div></div></div></div>
1	J	176	<div><div></div><div>60%33%<div><div></div><div></div></div></div></div>
1	K	176	<div>%<div><div></div><div>60%32%5%<div><div></div><div></div></div></div></div></div>
1	L	176	<div>%<div><div></div><div>65%28%<div><div></div><div></div></div></div></div></div>

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 18174 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 Spermidine n1-acetyltransferase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	170	Total	C	N	O	S	0	0	0
			1439	921	253	262	3			
1	B	169	Total	C	N	O	S	0	1	0
			1437	920	250	264	3			
1	C	169	Total	C	N	O	S	0	0	0
			1423	912	247	261	3			
1	D	168	Total	C	N	O	S	0	0	0
			1420	911	247	259	3			
1	E	170	Total	C	N	O	S	0	0	0
			1439	921	253	262	3			
1	F	169	Total	C	N	O	S	0	0	0
			1428	915	249	261	3			
1	G	170	Total	C	N	O	S	0	1	0
			1447	925	255	264	3			
1	H	169	Total	C	N	O	S	0	0	0
			1428	915	249	261	3			
1	I	169	Total	C	N	O	S	0	0	0
			1428	915	249	261	3			
1	J	169	Total	C	N	O	S	0	1	0
			1439	921	253	262	3			
1	K	170	Total	C	N	O	S	0	0	0
			1439	921	253	262	3			
1	L	169	Total	C	N	O	S	0	0	0
			1428	915	249	261	3			

There are 36 discrepancies between the modelled and reference sequences:

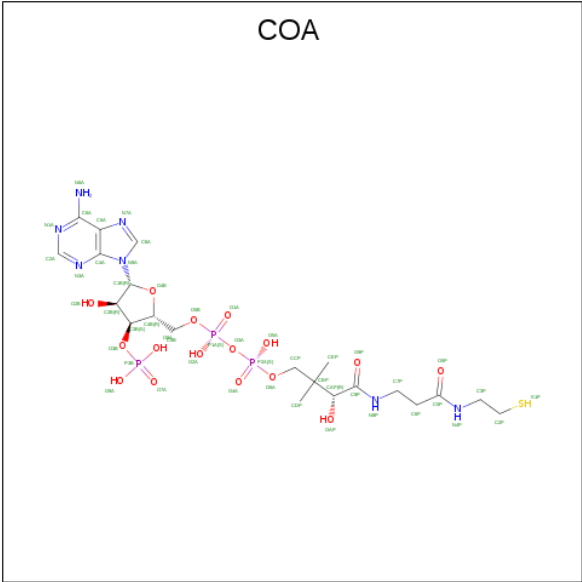
Chain	Residue	Modelled	Actual	Comment	Reference
A	-2	SER	-	EXPRESSION TAG	UNP Q9KL03
A	-1	ASN	-	EXPRESSION TAG	UNP Q9KL03
A	0	ALA	-	EXPRESSION TAG	UNP Q9KL03
B	-2	SER	-	EXPRESSION TAG	UNP Q9KL03
B	-1	ASN	-	EXPRESSION TAG	UNP Q9KL03

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Chain	Residue	Modelled	Actual	Comment	Reference
B	0	ALA	-	EXPRESSION TAG	UNP Q9KL03
C	-2	SER	-	EXPRESSION TAG	UNP Q9KL03
C	-1	ASN	-	EXPRESSION TAG	UNP Q9KL03
C	0	ALA	-	EXPRESSION TAG	UNP Q9KL03
D	-2	SER	-	EXPRESSION TAG	UNP Q9KL03
D	-1	ASN	-	EXPRESSION TAG	UNP Q9KL03
D	0	ALA	-	EXPRESSION TAG	UNP Q9KL03
E	-2	SER	-	EXPRESSION TAG	UNP Q9KL03
E	-1	ASN	-	EXPRESSION TAG	UNP Q9KL03
E	0	ALA	-	EXPRESSION TAG	UNP Q9KL03
F	-2	SER	-	EXPRESSION TAG	UNP Q9KL03
F	-1	ASN	-	EXPRESSION TAG	UNP Q9KL03
F	0	ALA	-	EXPRESSION TAG	UNP Q9KL03
G	-2	SER	-	EXPRESSION TAG	UNP Q9KL03
G	-1	ASN	-	EXPRESSION TAG	UNP Q9KL03
G	0	ALA	-	EXPRESSION TAG	UNP Q9KL03
H	-2	SER	-	EXPRESSION TAG	UNP Q9KL03
H	-1	ASN	-	EXPRESSION TAG	UNP Q9KL03
H	0	ALA	-	EXPRESSION TAG	UNP Q9KL03
I	-2	SER	-	EXPRESSION TAG	UNP Q9KL03
I	-1	ASN	-	EXPRESSION TAG	UNP Q9KL03
I	0	ALA	-	EXPRESSION TAG	UNP Q9KL03
J	-2	SER	-	EXPRESSION TAG	UNP Q9KL03
J	-1	ASN	-	EXPRESSION TAG	UNP Q9KL03
J	0	ALA	-	EXPRESSION TAG	UNP Q9KL03
K	-2	SER	-	EXPRESSION TAG	UNP Q9KL03
K	-1	ASN	-	EXPRESSION TAG	UNP Q9KL03
K	0	ALA	-	EXPRESSION TAG	UNP Q9KL03
L	-2	SER	-	EXPRESSION TAG	UNP Q9KL03
L	-1	ASN	-	EXPRESSION TAG	UNP Q9KL03
L	0	ALA	-	EXPRESSION TAG	UNP Q9KL03

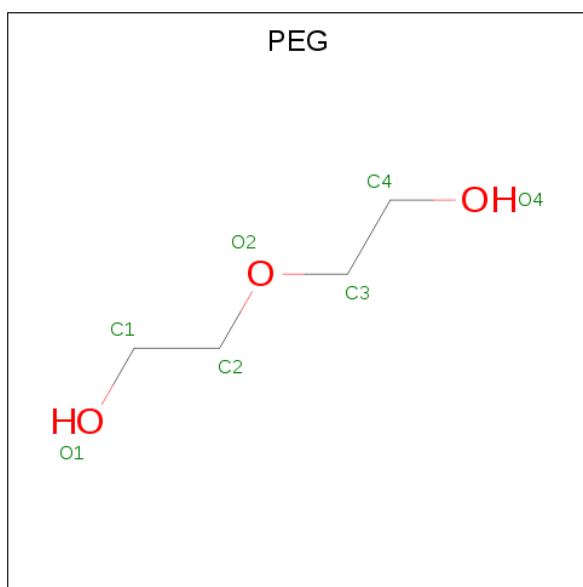
- Molecule 2 is COENZYME A (three-letter code: COA) (formula: $C_{21}H_{36}N_7O_{16}P_3S$).



Mol	Chain	Residues	Atoms						ZeroOcc	AltConf
2	A	1	Total	C	N	O	P	S	0	0
			48	21	7	16	3	1		
2	B	1	Total	C	N	O	P		0	0
			41	17	6	15	3			
2	C	1	Total	C	N	O	P	S	0	0
			48	21	7	16	3	1		
2	D	1	Total	C	N	O	P		0	0
			41	17	6	15	3			
2	E	1	Total	C	N	O	P	S	0	0
			48	21	7	16	3	1		
2	F	1	Total	C	N	O	P	S	0	0
			48	21	7	16	3	1		
2	G	1	Total	C		O	P		0	0
			21	5		13	3			
2	H	1	Total	C	N	O	P	S	0	0
			48	21	7	16	3	1		
2	I	1	Total	C	N	O	P		0	0
			39	16	5	15	3			
2	J	1	Total	C	N	O	P	S	0	0
			48	21	7	16	3	1		
2	K	1	Total	C	N	O	P	S	0	0
			48	21	7	16	3	1		
2	L	1	Total	C	N	O	P	S	0	0
			48	21	7	16	3	1		

- Molecule 3 is SPERMINE (three-letter code: SPM) (formula: C₁₀H₂₆N₄).





Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	H	1	Total	C	O	0	0
			7	4	3		
4	I	1	Total	C	O	0	0
			7	4	3		
4	L	1	Total	C	O	0	0
			7	4	3		

- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	21	Total	O	0	0
			21	21		
5	B	30	Total	O	0	1
			31	31		
5	C	29	Total	O	0	0
			29	29		
5	D	38	Total	O	0	0
			38	38		
5	E	32	Total	O	0	0
			32	32		
5	F	35	Total	O	0	0
			35	35		
5	G	21	Total	O	0	0
			21	21		
5	H	32	Total	O	0	0
			32	32		
5	I	25	Total	O	0	0
			25	25		

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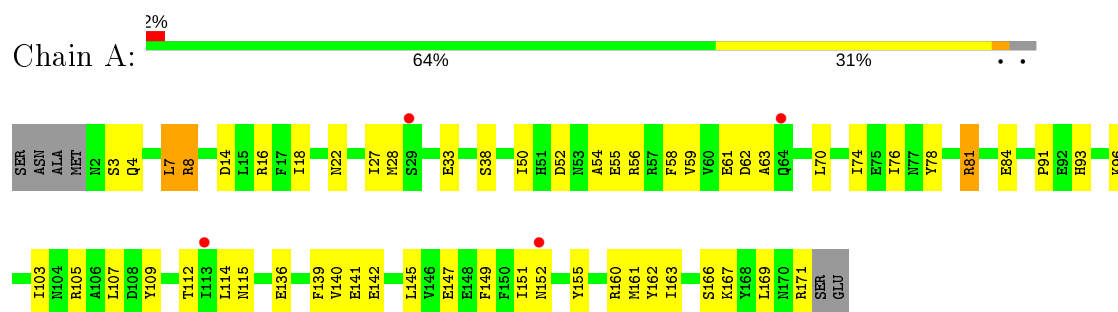
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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	J	31	Total 31	O 31	0	0
5	K	31	Total 31	O 31	0	0
5	L	22	Total 22	O 22	0	0

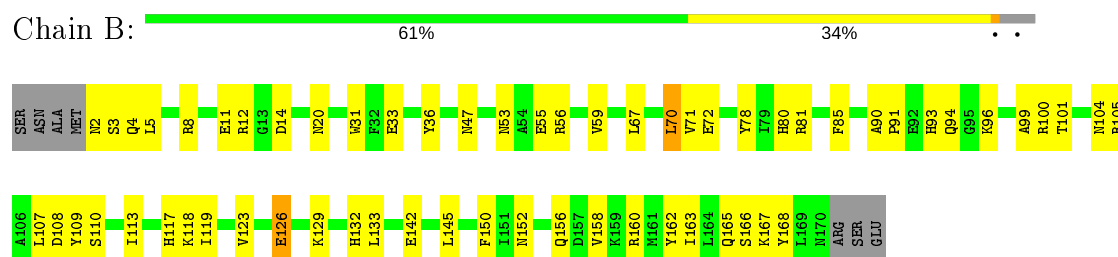
3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA and DNA 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.

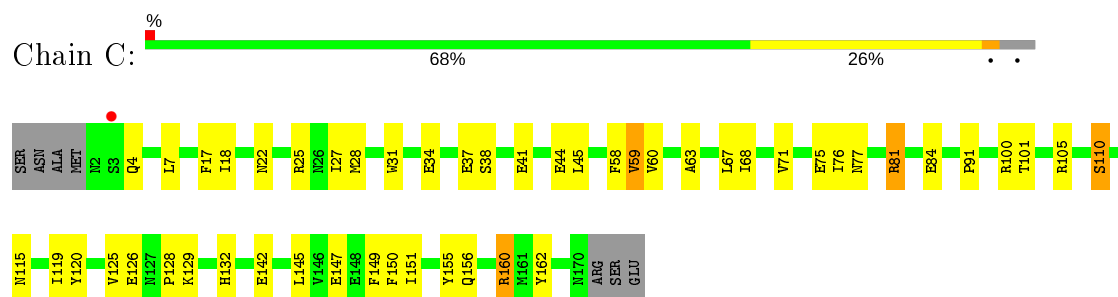
• Molecule 1: Spermidine n1-acetyltransferase



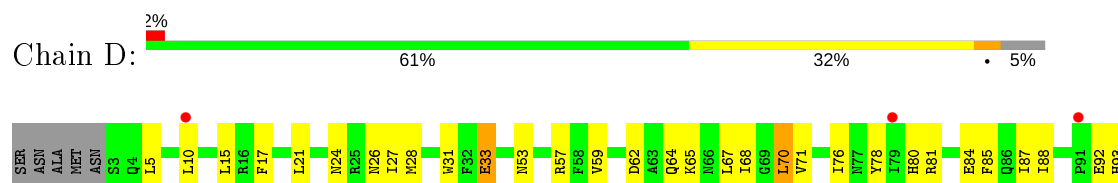
• Molecule 1: Spermidine n1-acetyltransferase

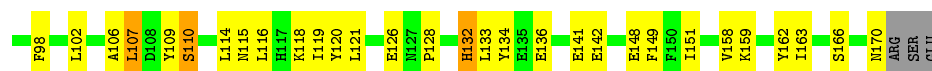


• Molecule 1: Spermidine n1-acetyltransferase



• Molecule 1: Spermidine n1-acetyltransferase

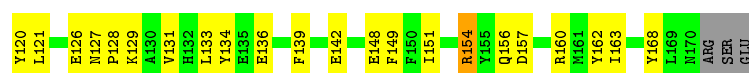




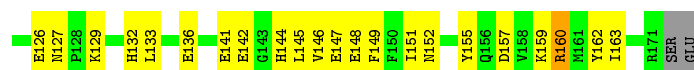
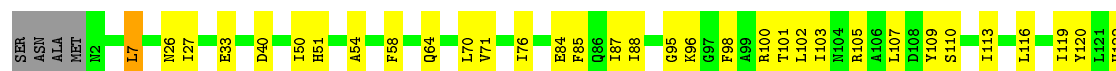
- Molecule 1: Spermidine n1-acetyltransferase



- Molecule 1: Spermidine n1-acetyltransferase



- Molecule 1: Spermidine n1-acetyltransferase

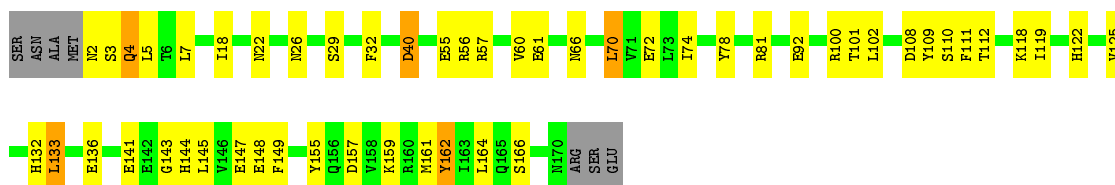


- Molecule 1: Spermidine n1-acetyltransferase



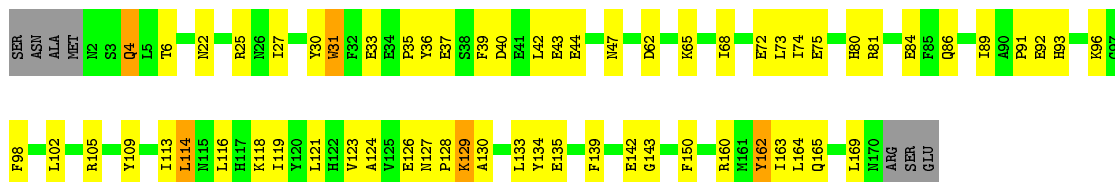
- Molecule 1: Spermidine n1-acetyltransferase





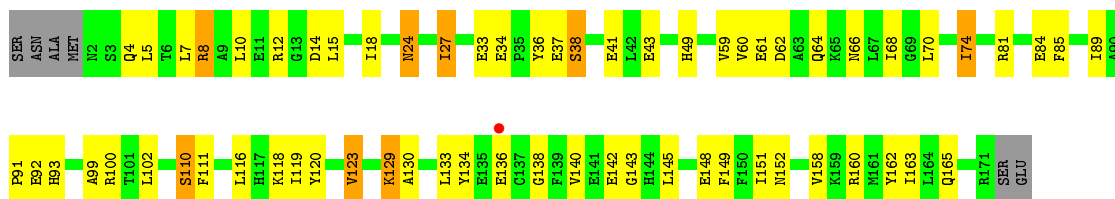
• Molecule 1: Spermidine n1-acetyltransferase

Chain J: 60% 33%



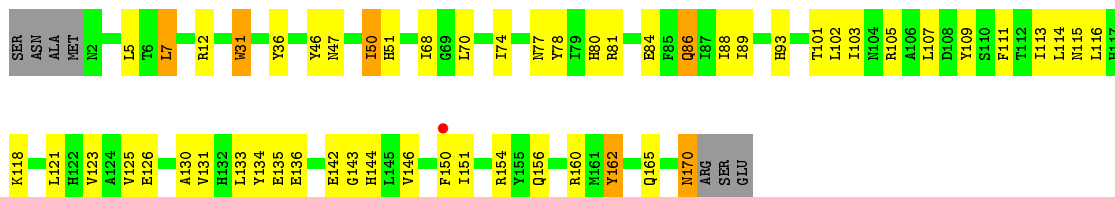
• Molecule 1: Spermidine n1-acetyltransferase

Chain K: % 60% 32% 5%



• Molecule 1: Spermidine n1-acetyltransferase

Chain L: % 65% 28%



4 Data and refinement statistics

Property	Value	Source
Space group	P 3	Depositor
Cell constants a, b, c, α , β , γ	176.95Å 176.95Å 67.01Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	43.82 – 2.61 43.82 – 2.61	Depositor EDS
% Data completeness (in resolution range)	95.7 (43.82-2.61) 95.7 (43.82-2.61)	Depositor EDS
R_{merge}	0.17	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.53 (at 2.61Å)	Xtriage
Refinement program	REFMAC 5.7.0032	Depositor
R, R_{free}	0.185 , 0.238 0.188 , 0.240	Depositor DCC
R_{free} test set	3381 reflections (4.96%)	wwPDB-VP
Wilson B-factor (Å ²)	36.5	Xtriage
Anisotropy	0.407	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.30 , 7.3	EDS
L-test for twinning ²	$\langle L \rangle = 0.47$, $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	0.447 for -h,-k,l 0.440 for h,-h-k,-l 0.437 for -k,-h,-l	Xtriage
Reported twinning fraction	0.271 for H, K, L 0.215 for -K, -H, -L 0.289 for -h,-k,l 0.224 for K, H, -L	Depositor
Outliers	0 of 68098 reflections	Xtriage
F_o, F_c correlation	0.93	EDS
Total number of atoms	18174	wwPDB-VP
Average B, all atoms (Å ²)	37.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 18.51% 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: COA, PEG, SPM

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	0.66	0/1472	0.88	2/1987 (0.1%)
1	B	0.71	0/1470	0.84	0/1985
1	C	0.69	0/1455	0.84	2/1965 (0.1%)
1	D	0.68	0/1453	0.82	1/1962 (0.1%)
1	E	0.75	0/1472	0.91	2/1987 (0.1%)
1	F	0.76	0/1461	0.86	1/1973 (0.1%)
1	G	0.78	0/1480	0.91	0/1998
1	H	0.75	0/1461	0.95	2/1973 (0.1%)
1	I	0.70	0/1461	0.86	1/1973 (0.1%)
1	J	0.68	0/1472	0.84	0/1987
1	K	0.70	0/1472	0.86	0/1987
1	L	0.67	0/1461	0.86	0/1973
All	All	0.71	0/17590	0.87	11/23750 (0.0%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	H	0	1

There are no bond length outliers.

The worst 5 of 11 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	I	40	ASP	CB-CG-OD1	-6.25	112.68	118.30
1	C	76	ILE	N-CA-C	-6.04	94.69	111.00
1	A	81	ARG	NE-CZ-NH2	5.84	123.22	120.30
1	E	123	VAL	CB-CA-C	-5.63	100.69	111.40

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	H	12	ARG	NE-CZ-NH2	5.35	122.97	120.30

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	H	169	LEU	Peptide

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	1439	0	1397	34	0
1	B	1437	0	1389	39	0
1	C	1423	0	1379	33	0
1	D	1420	0	1378	46	0
1	E	1439	0	1397	39	0
1	F	1428	0	1384	28	0
1	G	1447	0	1402	42	0
1	H	1428	0	1384	33	0
1	I	1428	0	1384	38	0
1	J	1439	0	1396	54	0
1	K	1439	0	1397	52	0
1	L	1428	0	1384	45	0
2	A	48	0	32	0	0
2	B	41	0	22	3	0
2	C	48	0	32	3	0
2	D	41	0	22	0	0
2	E	48	0	32	2	0
2	F	48	0	32	4	0
2	G	21	0	6	1	0
2	H	48	0	32	1	0
2	I	39	0	21	0	0
2	J	48	0	32	5	0
2	K	48	0	32	1	0
2	L	48	0	32	6	0
3	E	14	0	26	1	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	G	14	0	26	0	0
3	H	14	0	26	0	0
3	I	14	0	26	0	0
3	J	14	0	26	1	0
3	K	14	0	26	1	0
4	H	7	0	10	0	0
4	I	7	0	10	0	0
4	L	7	0	10	0	0
5	A	21	0	0	2	0
5	B	31	0	0	1	0
5	C	29	0	0	1	0
5	D	38	0	0	0	0
5	E	32	0	0	1	0
5	F	35	0	0	1	0
5	G	21	0	0	1	0
5	H	32	0	0	3	0
5	I	25	0	0	1	0
5	J	31	0	0	0	0
5	K	31	0	0	2	0
5	L	22	0	0	1	0
All	All	18174	0	17184	446	0

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

The worst 5 of 446 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:K:129:LYS:HD3	2:K:201:COA:H8A	1.44	0.99
2:C:201:COA:H132	2:C:201:COA:O9P	1.77	0.84
2:L:201:COA:H132	2:L:201:COA:O9P	1.78	0.83
1:I:18:ILE:HD12	1:I:70:LEU:HD11	1.62	0.80
1:F:129:LYS:HG2	2:F:201:COA:O2B	1.83	0.78

There are no symmetry-related clashes.

5.3 Torsion angles

5.3.1 Protein backbone

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

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

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	168/176 (96%)	150 (89%)	18 (11%)	0	100	100
1	B	168/176 (96%)	148 (88%)	20 (12%)	0	100	100
1	C	167/176 (95%)	152 (91%)	15 (9%)	0	100	100
1	D	166/176 (94%)	150 (90%)	16 (10%)	0	100	100
1	E	168/176 (96%)	155 (92%)	13 (8%)	0	100	100
1	F	167/176 (95%)	156 (93%)	11 (7%)	0	100	100
1	G	169/176 (96%)	153 (90%)	16 (10%)	0	100	100
1	H	167/176 (95%)	150 (90%)	17 (10%)	0	100	100
1	I	167/176 (95%)	153 (92%)	14 (8%)	0	100	100
1	J	168/176 (96%)	145 (86%)	23 (14%)	0	100	100
1	K	168/176 (96%)	146 (87%)	22 (13%)	0	100	100
1	L	167/176 (95%)	148 (89%)	19 (11%)	0	100	100
All	All	2010/2112 (95%)	1806 (90%)	204 (10%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 Protein sidechains

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	154/159 (97%)	142 (92%)	12 (8%)	12	24
1	B	154/159 (97%)	143 (93%)	11 (7%)	14	28

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	C	152/159 (96%)	145 (95%)	7 (5%)	27	50
1	D	152/159 (96%)	141 (93%)	11 (7%)	14	27
1	E	154/159 (97%)	141 (92%)	13 (8%)	11	20
1	F	153/159 (96%)	146 (95%)	7 (5%)	27	50
1	G	155/159 (98%)	149 (96%)	6 (4%)	32	56
1	H	153/159 (96%)	150 (98%)	3 (2%)	55	77
1	I	153/159 (96%)	143 (94%)	10 (6%)	17	33
1	J	154/159 (97%)	147 (96%)	7 (4%)	27	50
1	K	154/159 (97%)	140 (91%)	14 (9%)	9	17
1	L	153/159 (96%)	146 (95%)	7 (5%)	27	50
All	All	1841/1908 (96%)	1733 (94%)	108 (6%)	19	37

5 of 108 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	E	110	SER
1	F	154	ARG
1	K	129	LYS
1	E	129	LYS
1	F	3	SER

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 28 such sidechains are listed below:

Mol	Chain	Res	Type
1	F	156	GLN
1	H	22	ASN
1	L	80	HIS
1	G	22	ASN
1	H	4	GLN

5.3.3 RNA ⓘ

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 carbohydrates in this entry.

5.6 Ligand geometry [i](#)

21 ligands are modelled in this entry.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# $ Z > 2$	Counts	RMSZ	# $ Z > 2$
2	COA	C	201	-	41,50,50	1.02	3 (7%)	52,75,75	2.46	11 (21%)
2	COA	E	201	-	41,50,50	0.97	1 (2%)	52,75,75	3.02	16 (30%)
2	COA	G	201	-	19,21,50	0.87	1 (5%)	28,33,75	1.38	4 (14%)
4	PEG	I	203	-	6,6,6	0.45	0	5,5,5	0.19	0
2	COA	I	201	-	33,41,50	1.12	3 (9%)	42,64,75	2.95	13 (30%)
2	COA	K	201	-	41,50,50	1.05	5 (12%)	52,75,75	2.64	14 (26%)
3	SPM	J	202	-	13,13,13	0.44	0	12,12,12	1.22	2 (16%)
3	SPM	H	202	-	13,13,13	0.42	0	12,12,12	1.05	1 (8%)
4	PEG	L	202	-	6,6,6	0.64	0	5,5,5	0.42	0
4	PEG	H	203	-	6,6,6	0.45	0	5,5,5	0.30	0
3	SPM	G	202	-	13,13,13	0.45	0	12,12,12	0.90	0
2	COA	B	201	-	35,43,50	1.09	3 (8%)	45,67,75	2.83	10 (22%)
2	COA	D	201	-	35,43,50	1.12	4 (11%)	45,67,75	3.40	13 (28%)
2	COA	F	201	-	41,50,50	1.09	4 (9%)	52,75,75	2.48	10 (19%)
3	SPM	I	202	-	13,13,13	0.49	0	12,12,12	0.99	0
2	COA	H	201	-	41,50,50	1.08	4 (9%)	52,75,75	2.50	14 (26%)
2	COA	J	201	-	41,50,50	1.08	2 (4%)	52,75,75	2.90	14 (26%)
3	SPM	E	202	-	13,13,13	0.45	0	12,12,12	0.84	0
2	COA	L	201	-	41,50,50	1.16	4 (9%)	52,75,75	2.40	11 (21%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
3	SPM	K	202	-	13,13,13	0.41	0	12,12,12	0.85	0
2	COA	A	201	-	41,50,50	1.08	3 (7%)	52,75,75	2.68	13 (25%)

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	C	201	-	-	17/44/64/64	0/3/3/3
2	COA	E	201	-	-	12/44/64/64	0/3/3/3
2	COA	G	201	-	-	7/17/30/64	0/1/1/3
4	PEG	I	203	-	-	2/4/4/4	-
2	COA	I	201	-	-	9/30/52/64	0/3/3/3
2	COA	K	201	-	-	7/44/64/64	0/3/3/3
3	SPM	J	202	-	-	8/11/11/11	-
3	SPM	H	202	-	-	7/11/11/11	-
4	PEG	L	202	-	-	1/4/4/4	-
4	PEG	H	203	-	-	2/4/4/4	-
3	SPM	G	202	-	-	7/11/11/11	-
2	COA	B	201	-	-	7/36/56/64	0/3/3/3
2	COA	D	201	-	-	12/36/56/64	0/3/3/3
2	COA	F	201	-	-	14/44/64/64	0/3/3/3
3	SPM	I	202	-	-	8/11/11/11	-
2	COA	H	201	-	-	11/44/64/64	0/3/3/3
2	COA	J	201	-	-	13/44/64/64	0/3/3/3
3	SPM	E	202	-	-	9/11/11/11	-
2	COA	L	201	-	-	19/44/64/64	0/3/3/3
3	SPM	K	202	-	-	5/11/11/11	-
2	COA	A	201	-	-	7/44/64/64	0/3/3/3

The worst 5 of 37 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	J	201	COA	O4B-C1B	3.46	1.45	1.41
2	L	201	COA	O4B-C1B	3.18	1.45	1.41
2	A	201	COA	O4B-C1B	3.13	1.45	1.41

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	I	201	COA	C5A-C4A	2.89	1.48	1.40
2	A	201	COA	C5A-C4A	2.86	1.48	1.40

The worst 5 of 146 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	201	COA	CEP-CBP-CCP	11.48	126.95	108.23
2	L	201	COA	CDP-CBP-CCP	11.45	126.90	108.23
2	D	201	COA	CAP-C9P-N8P	11.18	123.60	116.32
2	J	201	COA	CDP-CBP-CAP	-11.02	89.72	108.82
2	E	201	COA	CDP-CBP-CAP	-10.36	90.86	108.82

There are no chirality outliers.

5 of 184 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	C	201	COA	CCP-O6A-P2A-O3A
2	C	201	COA	C9P-CAP-CBP-CCP
2	C	201	COA	C9P-CAP-CBP-CDP
2	C	201	COA	OAP-CAP-CBP-CEP
2	C	201	COA	C9P-CAP-CBP-CEP

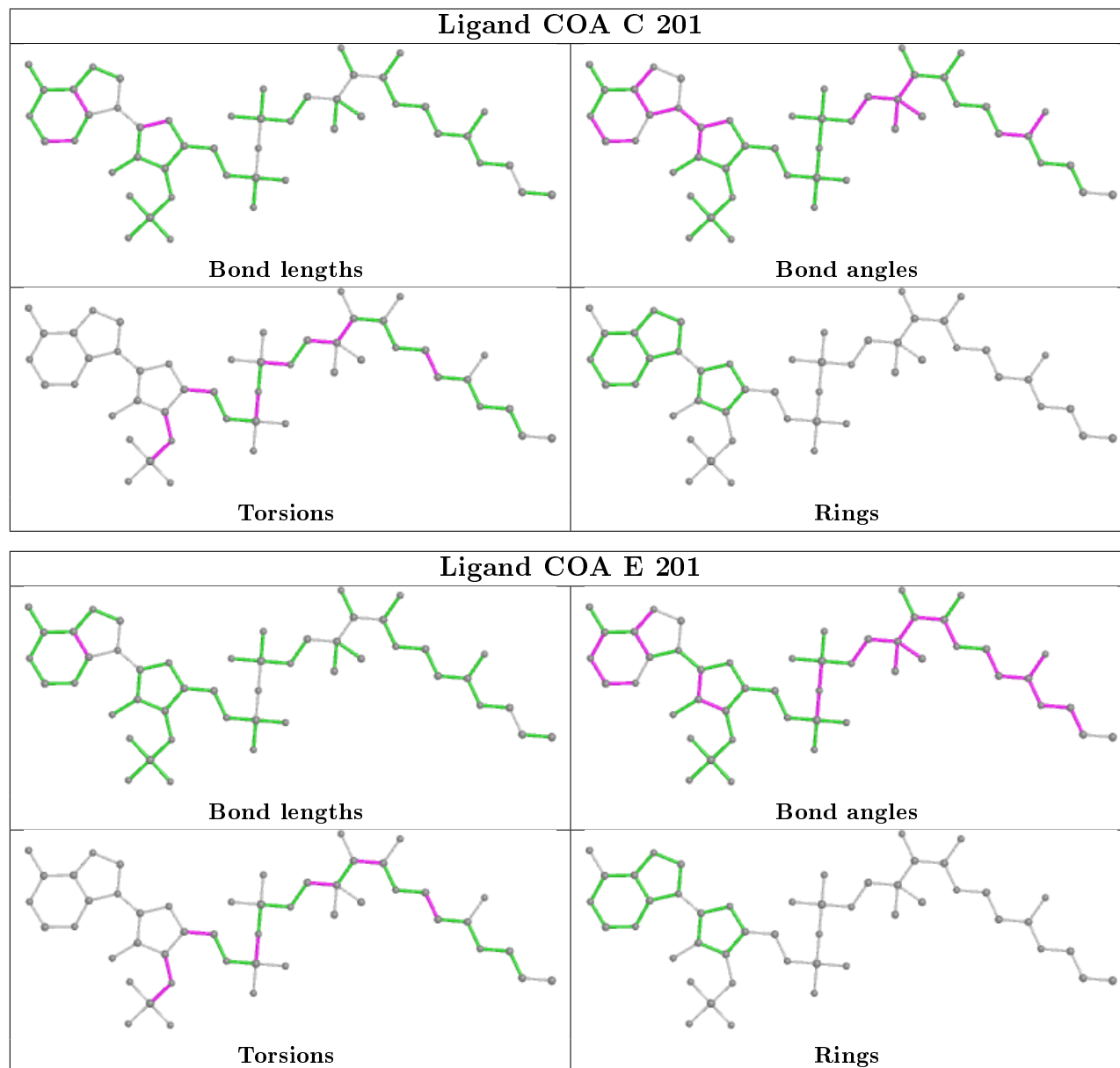
There are no ring outliers.

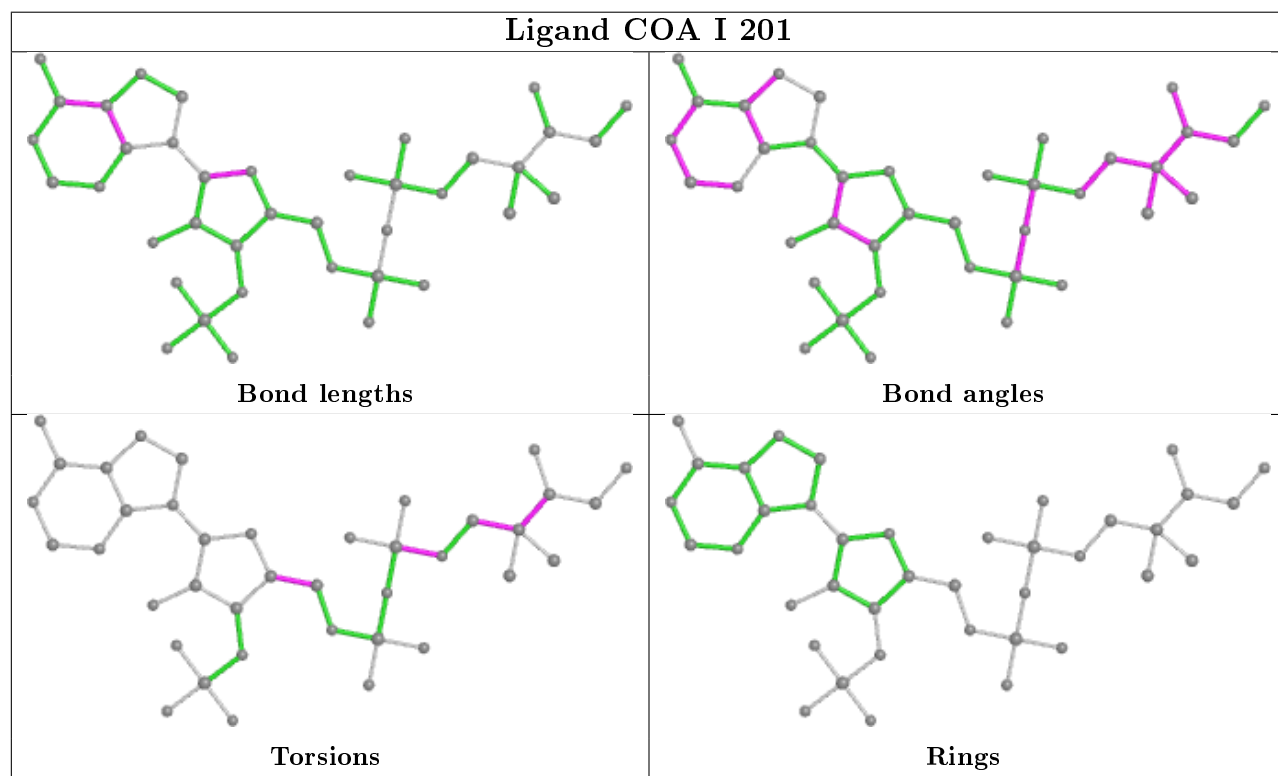
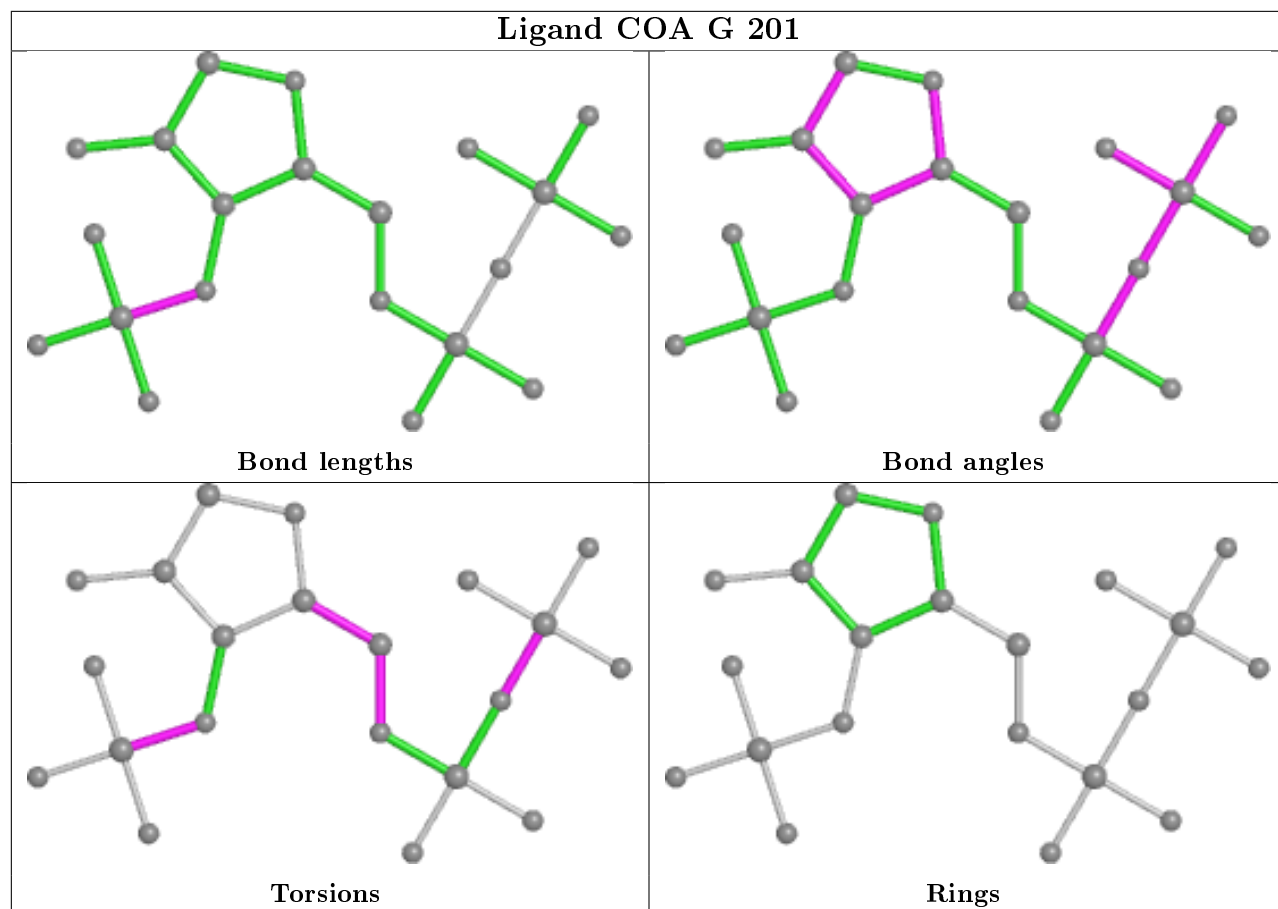
12 monomers are involved in 29 short contacts:

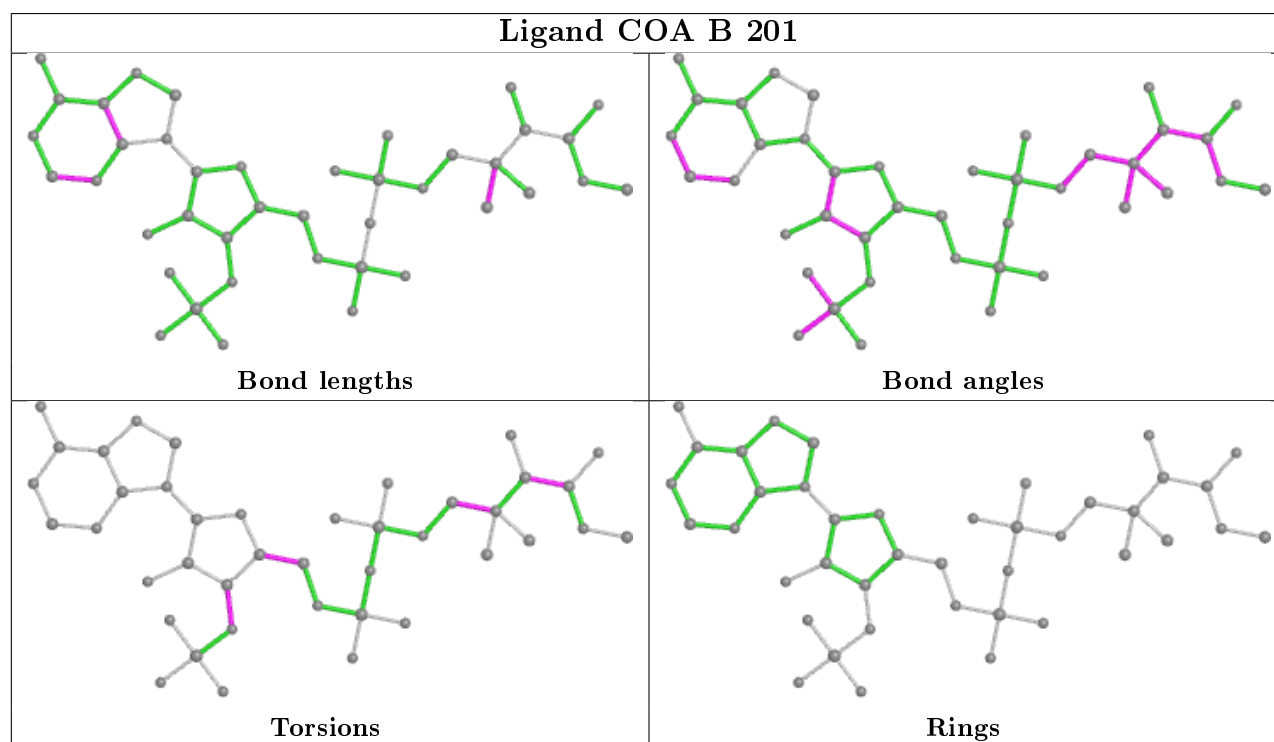
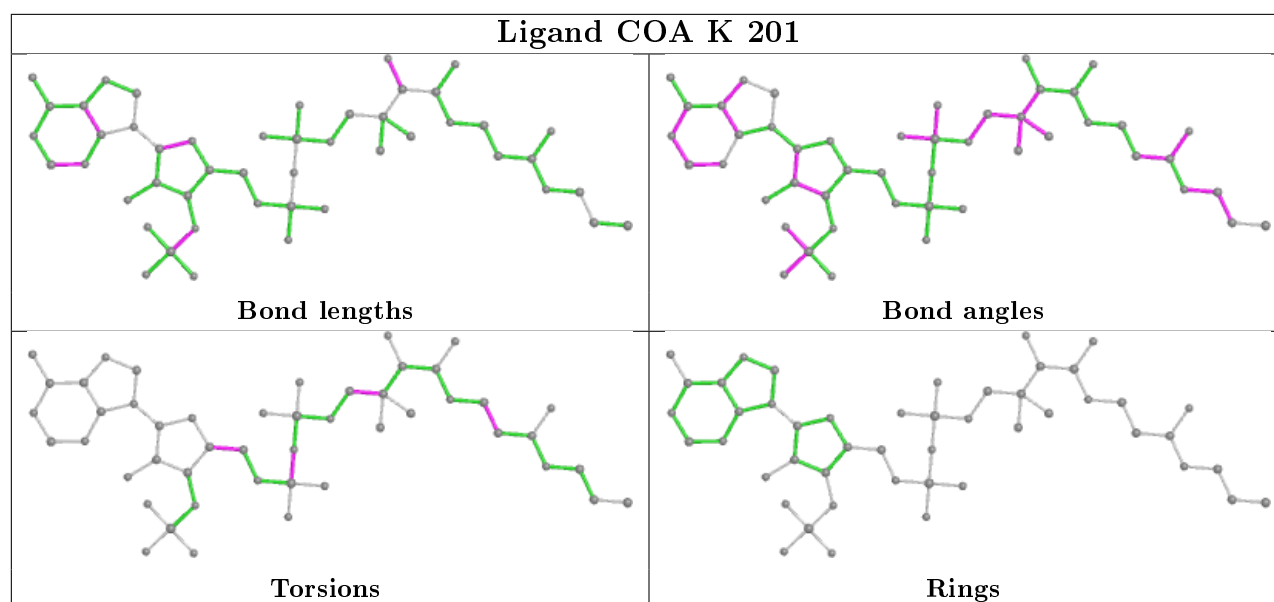
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	C	201	COA	3	0
2	E	201	COA	2	0
2	G	201	COA	1	0
2	K	201	COA	1	0
3	J	202	SPM	1	0
2	B	201	COA	3	0
2	F	201	COA	4	0
2	H	201	COA	1	0
2	J	201	COA	5	0
3	E	202	SPM	1	0
2	L	201	COA	6	0
3	K	202	SPM	1	0

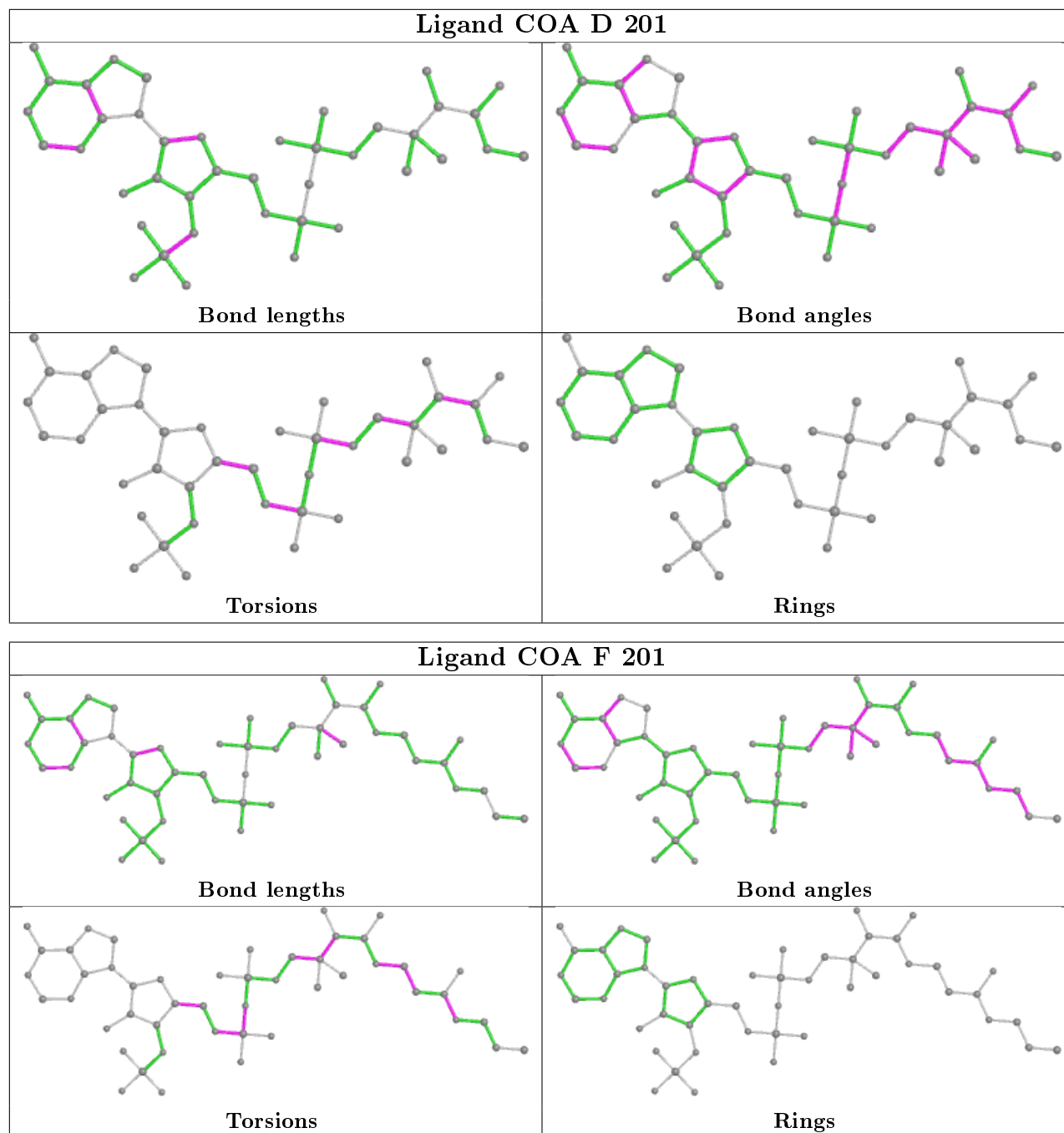
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In

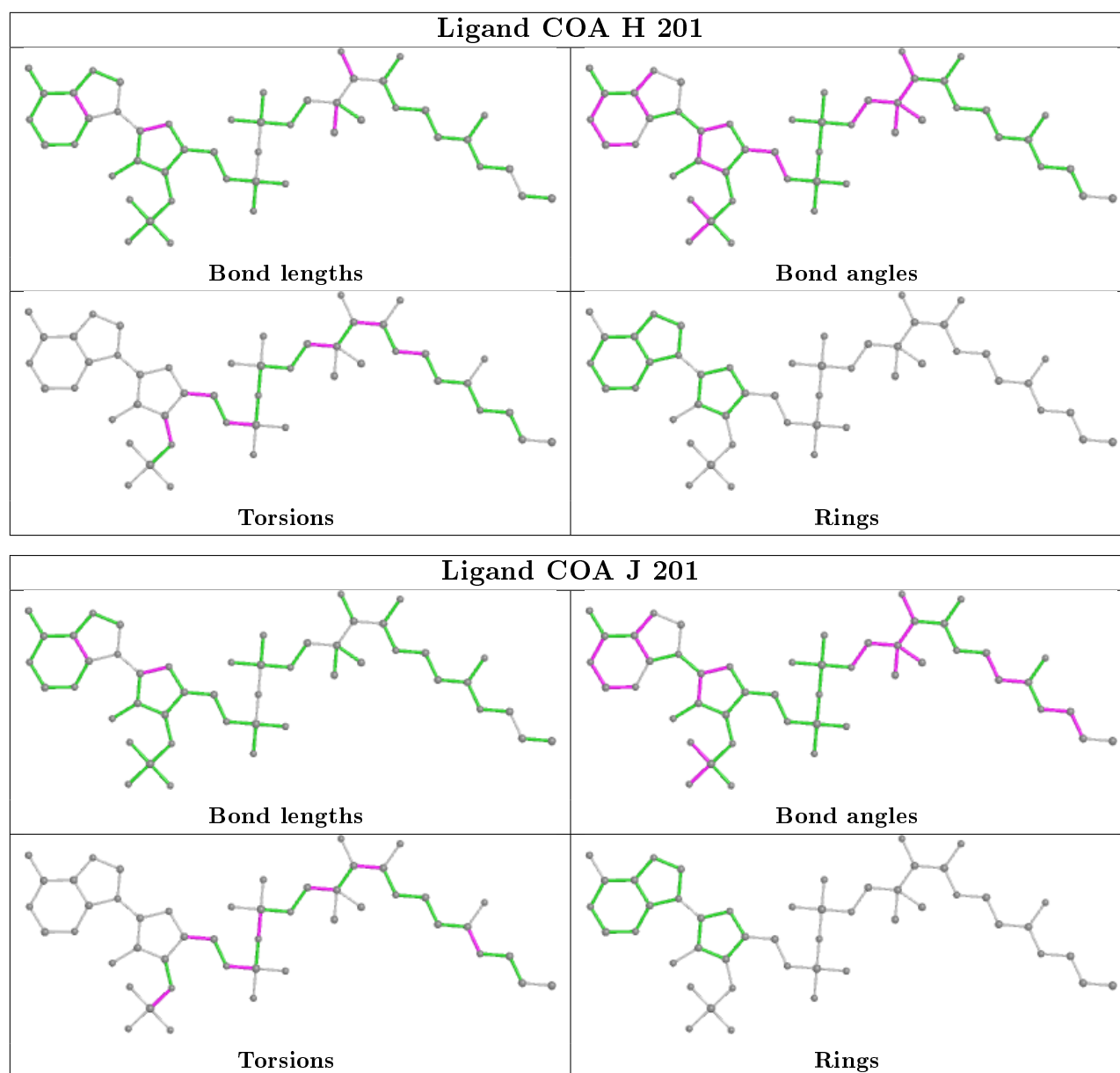
addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. 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.

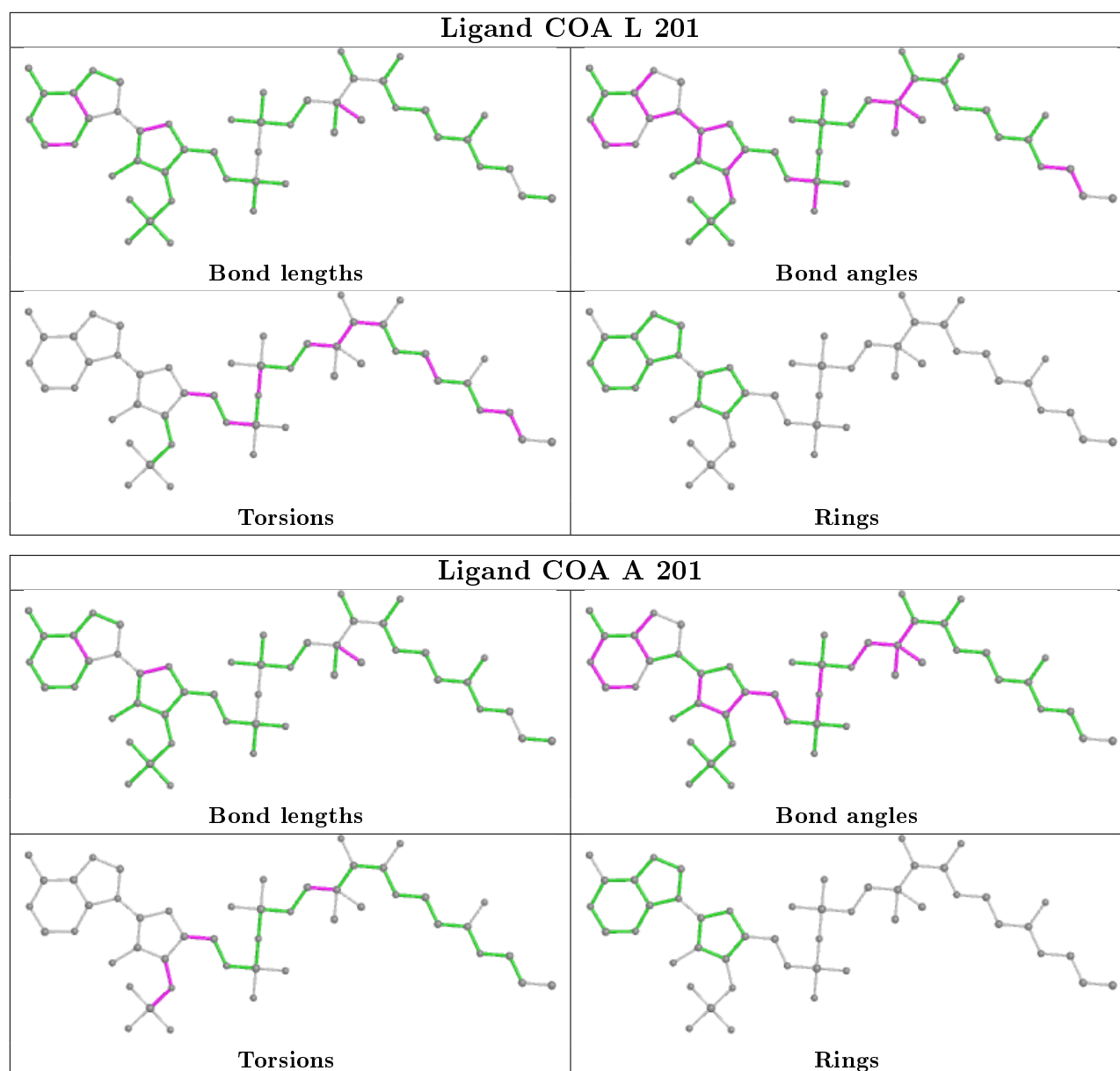












5.7 Other polymers ⓘ

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 ⓘ

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	170/176 (96%)	-0.07	4 (2%) 59 53	25, 41, 58, 70	0
1	B	169/176 (96%)	-0.13	0 100 100	26, 37, 55, 76	0
1	C	169/176 (96%)	-0.19	1 (0%) 89 88	28, 38, 55, 60	0
1	D	168/176 (95%)	-0.10	3 (1%) 68 64	29, 40, 61, 74	0
1	E	170/176 (96%)	-0.34	0 100 100	20, 31, 47, 55	0
1	F	169/176 (96%)	-0.38	1 (0%) 89 88	20, 32, 47, 75	0
1	G	170/176 (96%)	-0.33	0 100 100	19, 32, 50, 79	0
1	H	169/176 (96%)	-0.40	1 (0%) 89 88	21, 30, 47, 72	0
1	I	169/176 (96%)	-0.32	0 100 100	25, 36, 46, 60	0
1	J	169/176 (96%)	-0.18	0 100 100	24, 37, 48, 66	0
1	K	170/176 (96%)	-0.18	1 (0%) 89 88	22, 38, 59, 70	0
1	L	169/176 (96%)	-0.21	1 (0%) 89 88	24, 37, 51, 58	0
All	All	2031/2112 (96%)	-0.24	12 (0%) 89 88	19, 36, 54, 79	0

The worst 5 of 12 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	29	SER	3.1
1	D	91	PRO	3.0
1	F	83	ALA	2.9
1	A	113	ILE	2.8
1	D	10	LEU	2.7

6.2 Non-standard residues in protein, DNA, RNA chains ⓘ

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

6.3 Carbohydrates ⓘ

There are no carbohydrates in this entry.

6.4 Ligands ⓘ

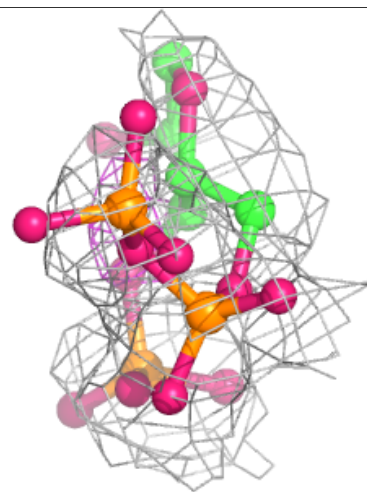
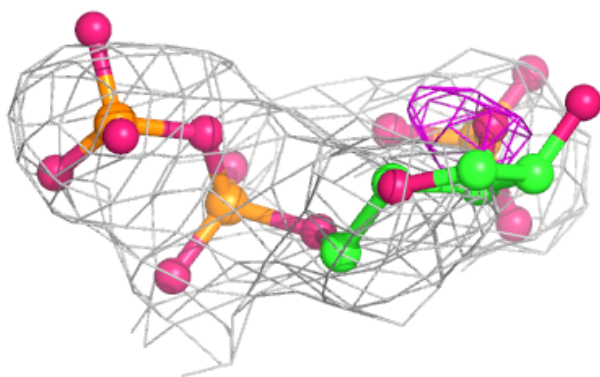
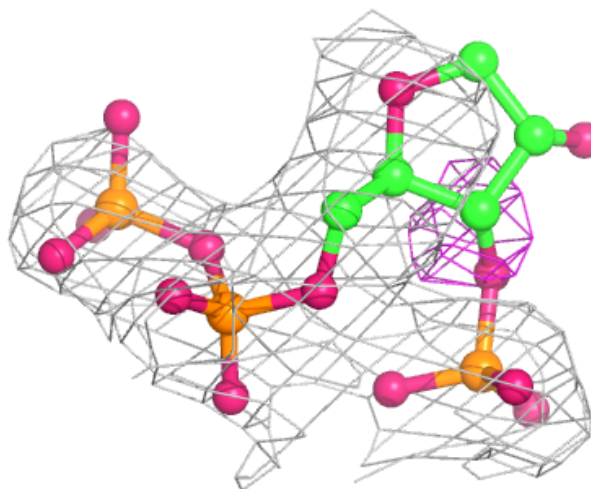
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
2	COA	G	201	21/48	0.77	0.32	90,98,102,106	0
2	COA	I	201	39/48	0.81	0.27	45,80,90,91	0
2	COA	D	201	41/48	0.82	0.23	39,86,101,102	0
2	COA	K	201	48/48	0.87	0.26	44,58,92,96	0
3	SPM	I	202	14/14	0.87	0.27	34,39,42,42	0
2	COA	A	201	48/48	0.87	0.23	49,68,85,93	0
2	COA	L	201	48/48	0.89	0.18	45,62,105,108	0
2	COA	B	201	41/48	0.90	0.22	39,54,72,75	0
2	COA	C	201	48/48	0.90	0.20	45,61,88,94	0
3	SPM	K	202	14/14	0.90	0.19	39,42,45,45	0
2	COA	F	201	48/48	0.90	0.18	46,59,97,99	0
4	PEG	L	202	7/7	0.91	0.15	45,45,47,48	0
4	PEG	H	203	7/7	0.91	0.17	38,40,45,47	0
3	SPM	H	202	14/14	0.91	0.20	39,45,49,51	0
3	SPM	J	202	14/14	0.92	0.20	26,34,47,50	0
2	COA	E	201	48/48	0.92	0.19	34,50,97,105	0
2	COA	J	201	48/48	0.92	0.19	33,46,85,87	0
4	PEG	I	203	7/7	0.93	0.15	56,58,60,62	0
2	COA	H	201	48/48	0.93	0.15	38,50,59,60	0
3	SPM	E	202	14/14	0.94	0.19	34,39,40,42	0
3	SPM	G	202	14/14	0.94	0.19	28,32,34,37	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.

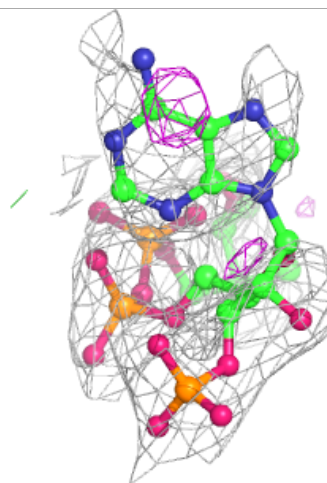
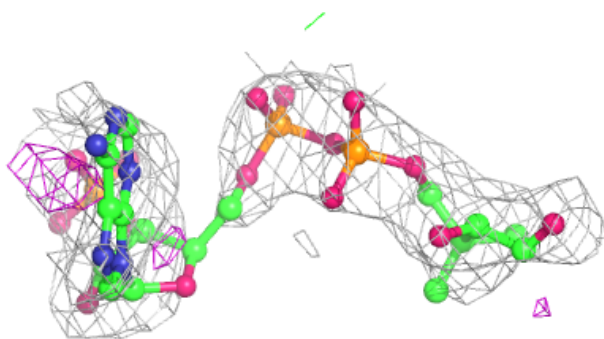
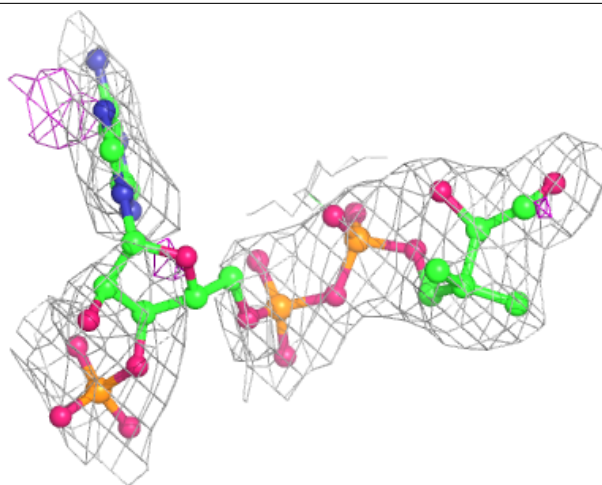
Electron density around COA G 201:

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



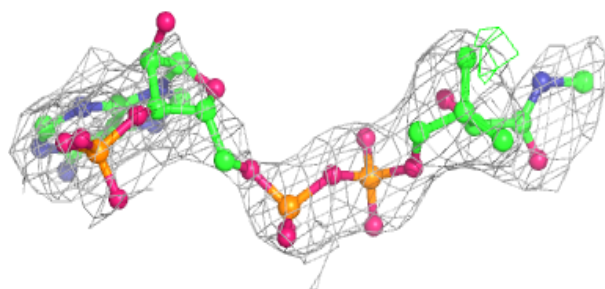
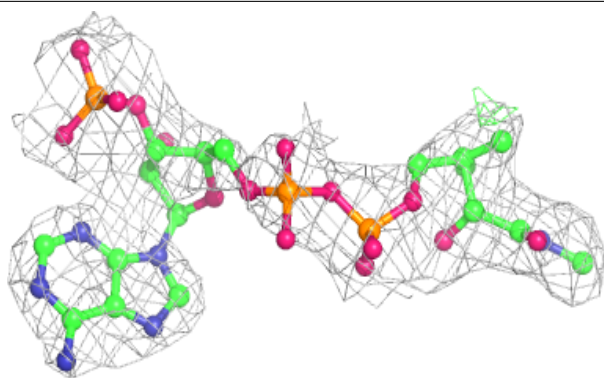
Electron density around COA I 201:

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

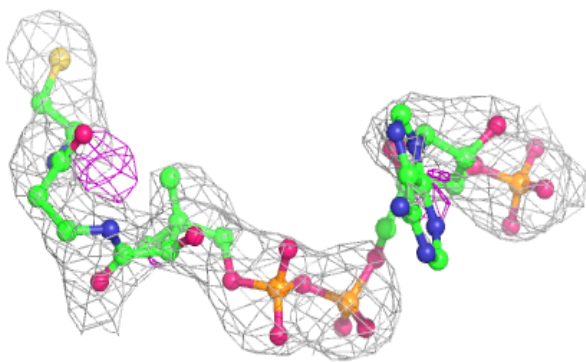
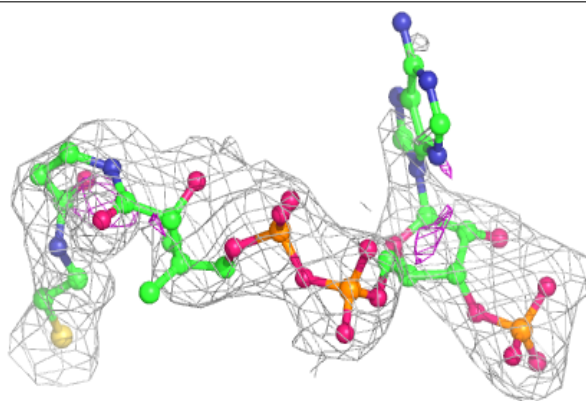


Electron density around COA D 201:

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

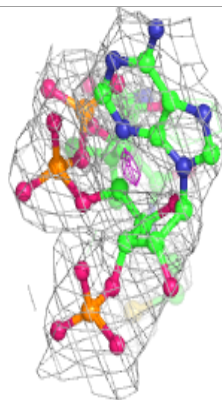
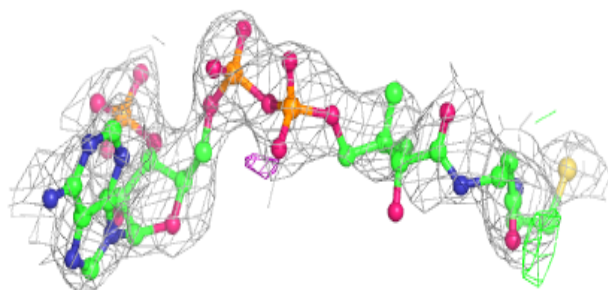
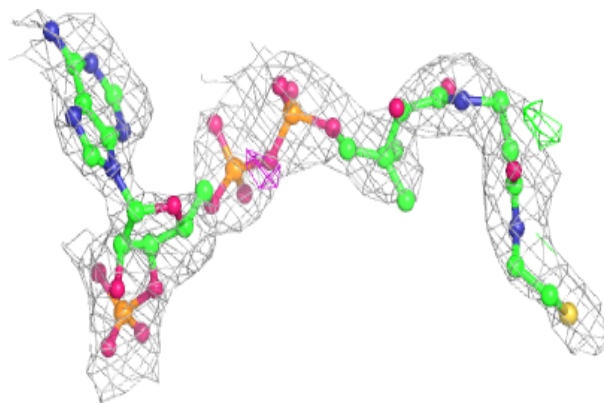
**Electron density around COA K 201:**

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

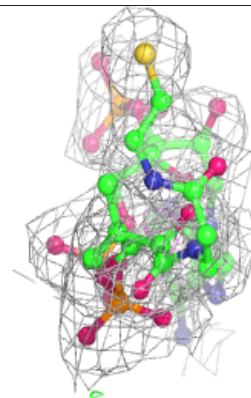
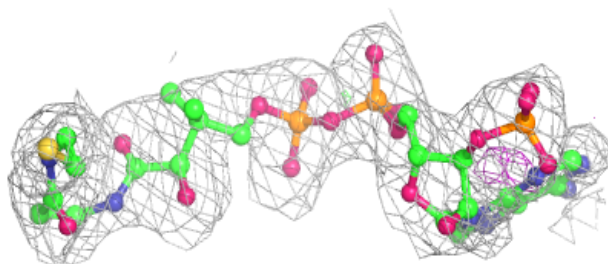
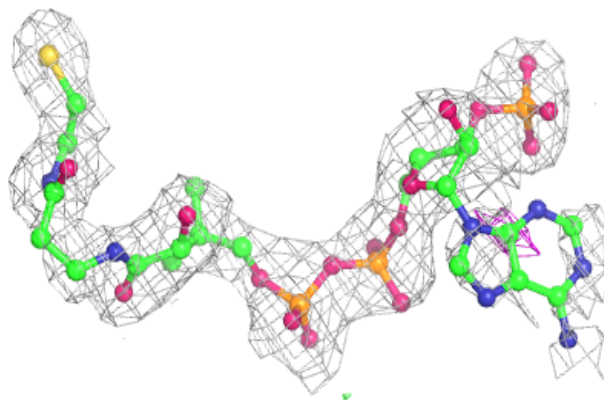


Electron density around COA A 201:

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

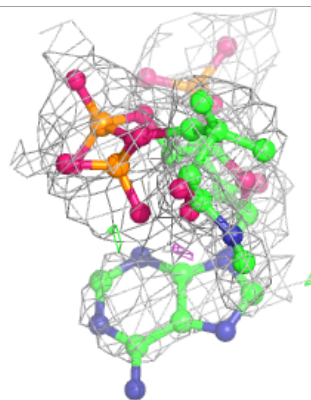
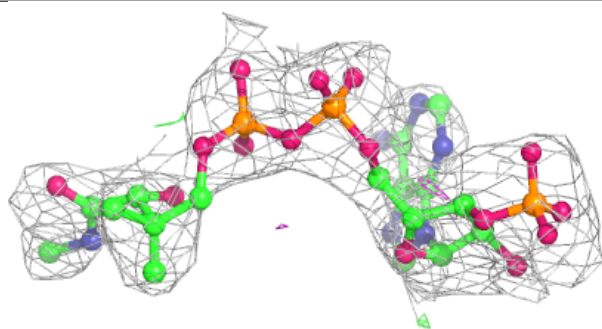
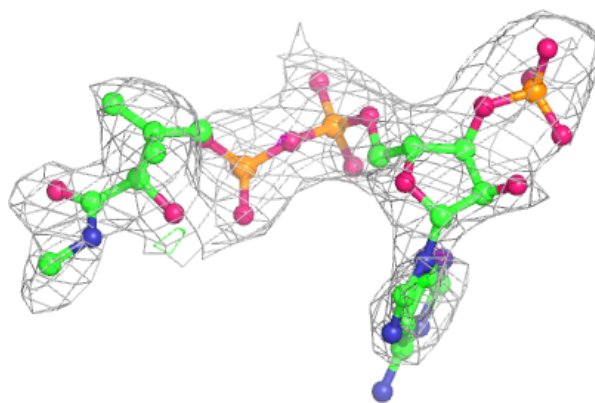
**Electron density around COA L 201:**

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

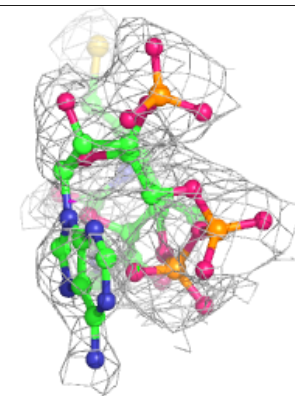
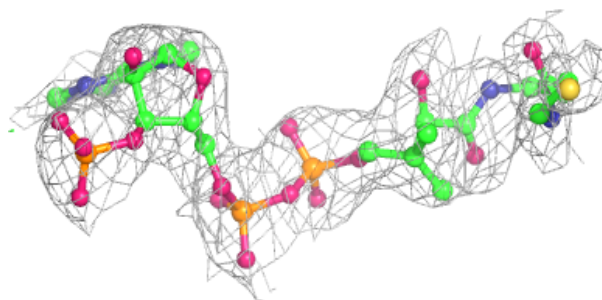
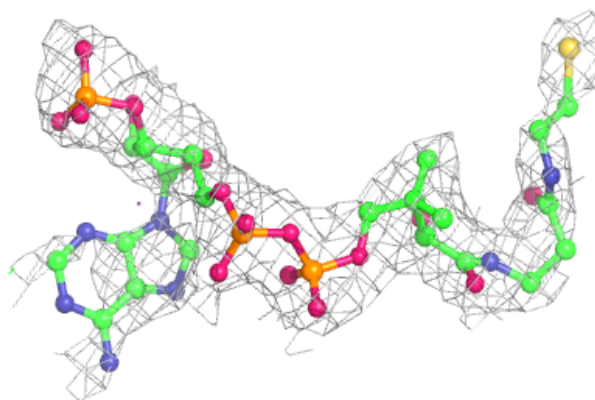


Electron density around COA B 201:

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

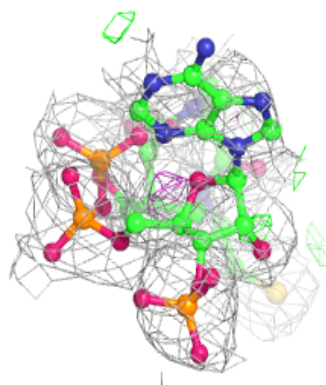
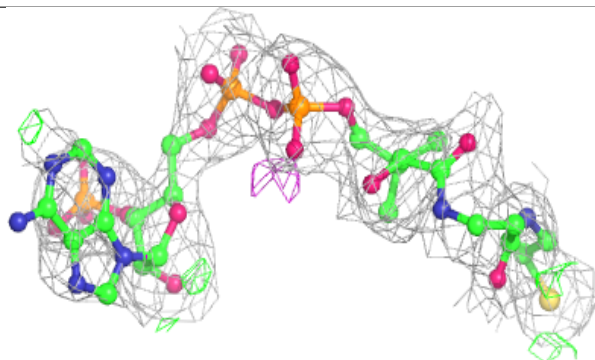
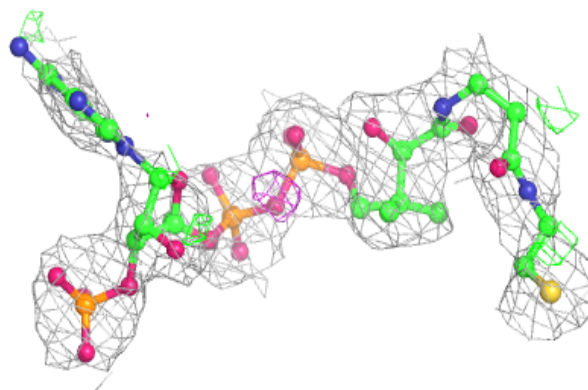
**Electron density around COA C 201:**

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

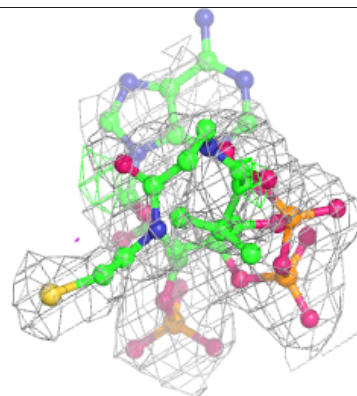
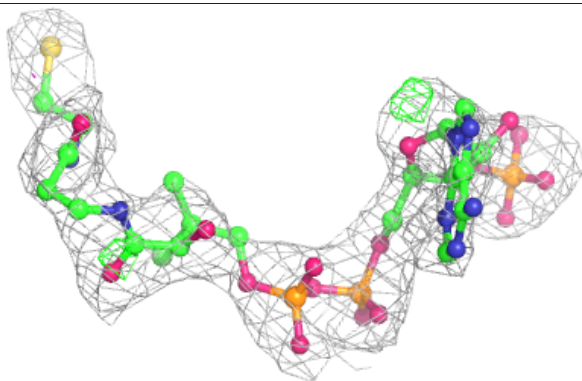
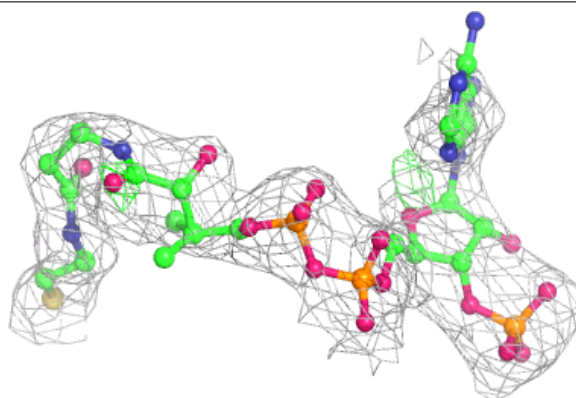


Electron density around COA F 201:

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

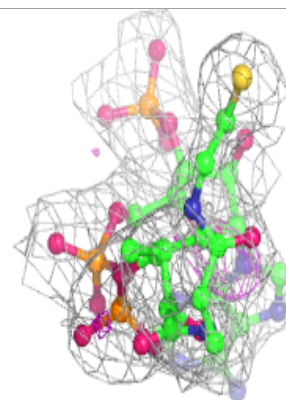
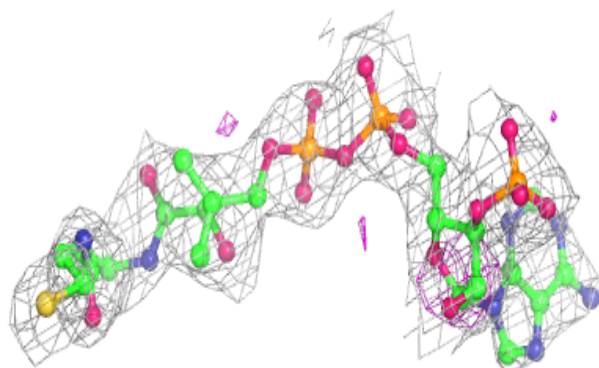
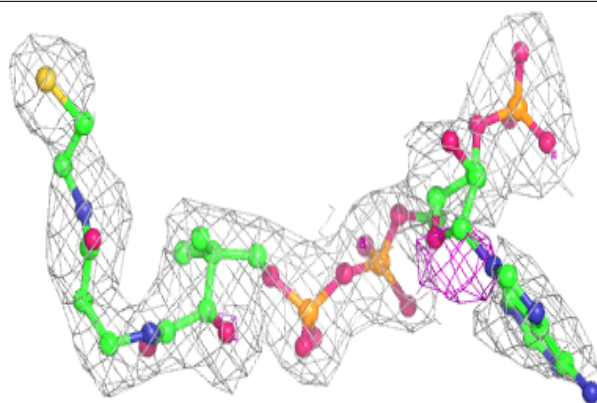
**Electron density around COA E 201:**

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

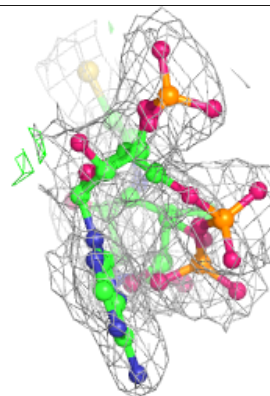
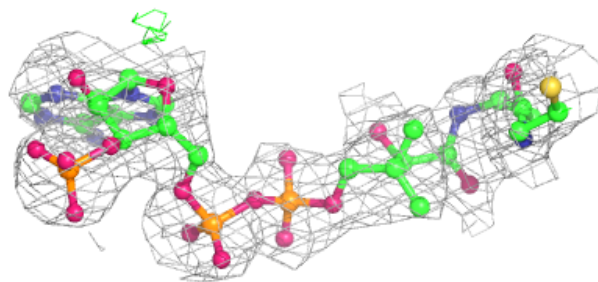
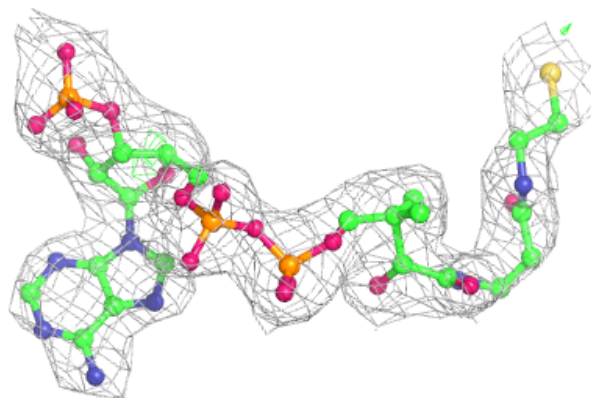


Electron density around COA J 201:

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

**Electron density around COA H 201:**

$2mF_o-DF_c$ (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.