



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 12:34 AM UTC

PDB ID : 2IBY / pdb_00002iby
Title : Crystallographic and kinetic studies of human mitochondrial acetoacetyl-CoA thiolase (T2): the importance of potassium and chloride for its structure and function
Authors : Haapalainen, A.M.; Wierenga, R.K.
Deposited on : 2006-09-12
Resolution : 1.85 Å(reported)

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

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

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

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

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

The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity	:	4-5-2 with Phenix2.0
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Buster-report	:	wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

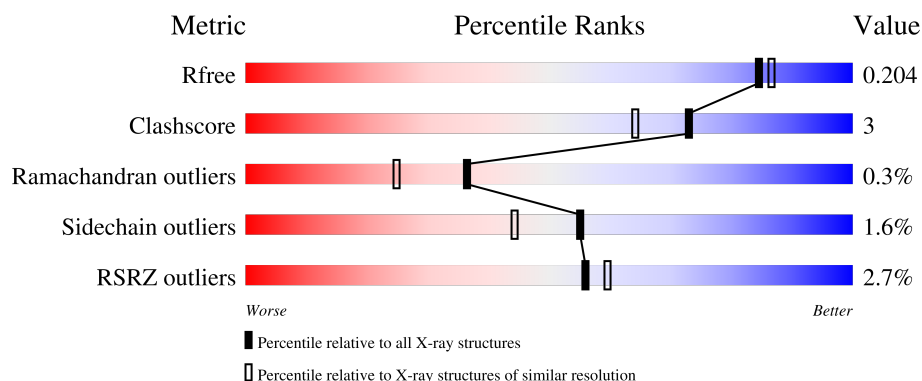
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.85 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	3428 (1.86-1.86)
Clashscore	190562	3579 (1.86-1.86)
Ramachandran outliers	187476	3553 (1.86-1.86)
Sidechain outliers	187428	3553 (1.86-1.86)
RSRZ outliers	180081	3429 (1.86-1.86)

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	395	% 92% 6% .
1	B	395	% 92% 7% .
1	C	395	5% 91% 7% ..
1	D	395	4% 91% 8% ..

2 Entry composition

There are 7 unique types of molecules in this entry. The entry contains 13011 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 Acetyl-CoA acetyltransferase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	391	Total	C	N	O	S	0	11	0
			2913	1842	491	559	21			
1	B	391	Total	C	N	O	S	0	14	0
			2921	1851	492	557	21			
1	C	393	Total	C	N	O	S	0	3	0
			2900	1830	494	555	21			
1	D	393	Total	C	N	O	S	0	1	0
			2891	1823	493	554	21			

There are 12 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	33	MET	-	initiating methionine	UNP P24752
A	34	ALA	VAL	engineered mutation	UNP P24752
A	126	CSO	CYS	modified residue	UNP P24752
B	33	MET	-	initiating methionine	UNP P24752
B	34	ALA	VAL	engineered mutation	UNP P24752
B	126	CSO	CYS	modified residue	UNP P24752
C	33	MET	-	initiating methionine	UNP P24752
C	34	ALA	VAL	engineered mutation	UNP P24752
C	126	CSO	CYS	modified residue	UNP P24752
D	33	MET	-	initiating methionine	UNP P24752
D	34	ALA	VAL	engineered mutation	UNP P24752
D	126	CSO	CYS	modified residue	UNP P24752

- Molecule 2 is CHLORIDE ION (CCD ID: CL) (formula: Cl).

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

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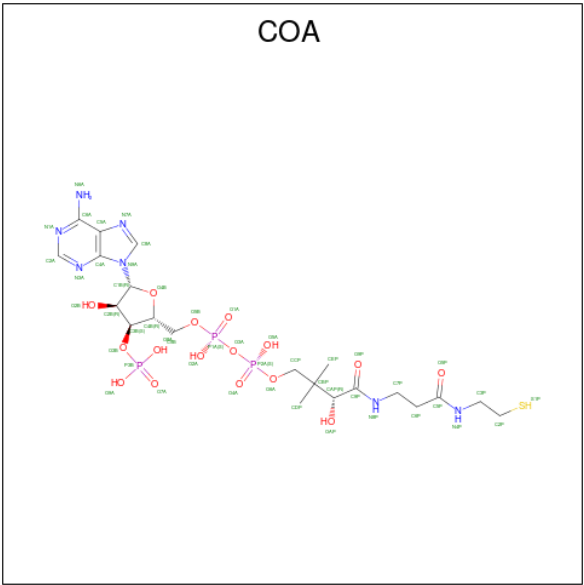
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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	C	1	Total	Cl	0	0
			1	1		
2	D	1	Total	Cl	0	0
			1	1		

- Molecule 3 is POTASSIUM ION (CCD ID: K) (formula: K).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	1	Total	K	0	0
			1	1		
3	B	1	Total	K	0	0
			1	1		
3	C	1	Total	K	0	0
			1	1		
3	D	1	Total	K	0	0
			1	1		

- Molecule 4 is COENZYME A (CCD ID: COA) (formula: C₂₁H₃₆N₇O₁₆P₃S).



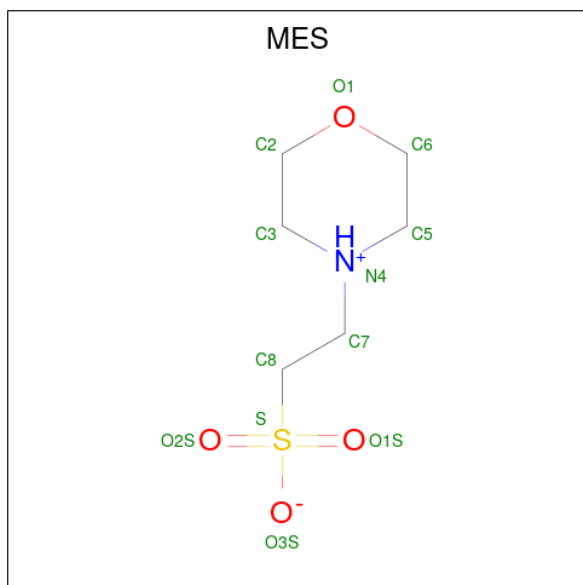
Mol	Chain	Residues	Atoms						ZeroOcc	AltConf
4	A	1	Total	C	N	O	P	S	0	0
			48	21	7	16	3	1		
4	B	1	Total	C	N	O	P	S	0	0
			48	21	7	16	3	1		
4	C	1	Total	C	N	O	P	S	0	0
			48	21	7	16	3	1		

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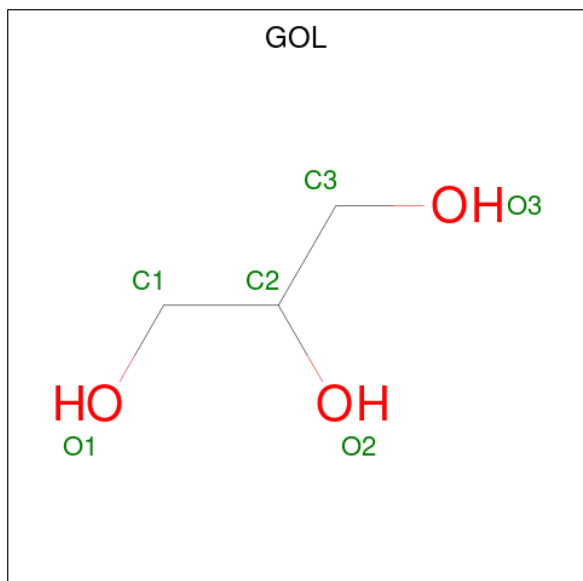
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
4	D	1	Total	C	N	O	P	S	
			48	21	7	16	3	1	
								0	0

- Molecule 5 is 2-(N-MORPHOLINO)-ETHANESULFONIC ACID (CCD ID: MES) (formula: $C_6H_{13}NO_4S$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
5	A	1	Total	C	N	O	S		
			12	6	1	4	1		
								0	0

- Molecule 6 is GLYCEROL (CCD ID: GOL) (formula: $C_3H_8O_3$).



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

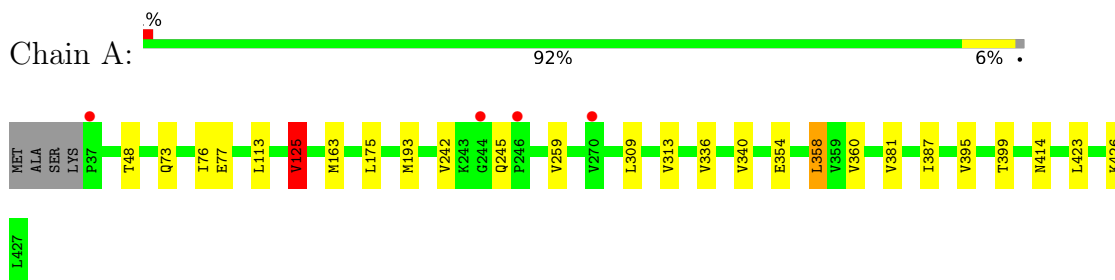
- Molecule 7 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	410	Total	O	0	0
			410	410		
7	B	376	Total	O	0	0
			376	376		
7	C	176	Total	O	0	0
			176	176		
7	D	200	Total	O	0	0
			200	200		

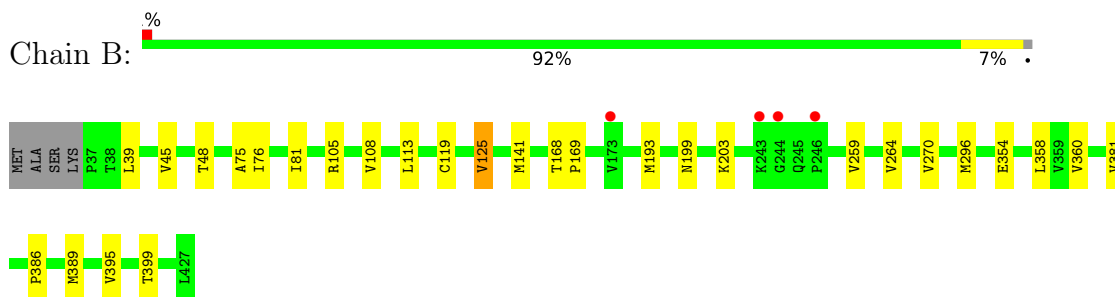
3 Residue-property plots [i](#)

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.

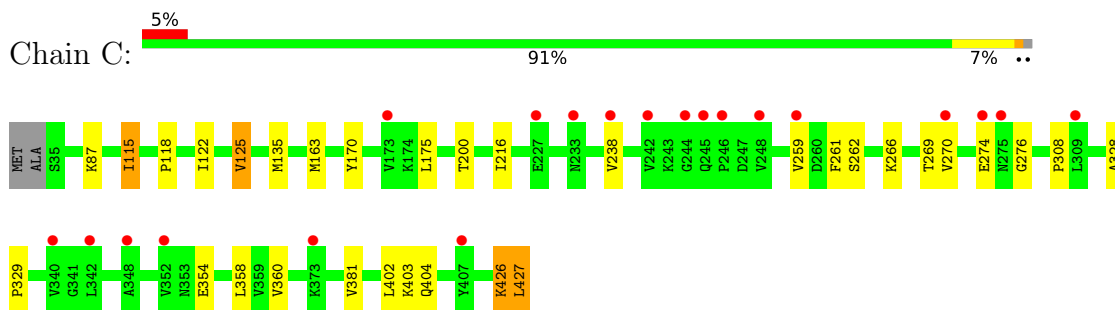
- Molecule 1: Acetyl-CoA acetyltransferase



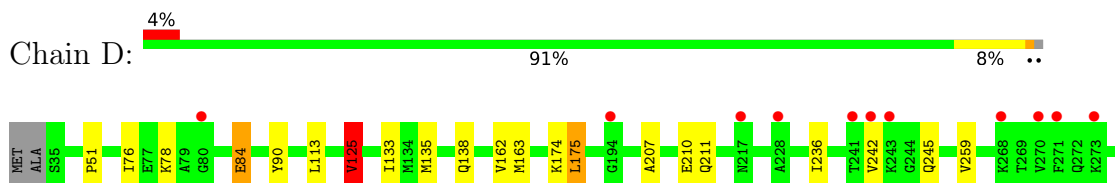
- Molecule 1: Acetyl-CoA acetyltransferase

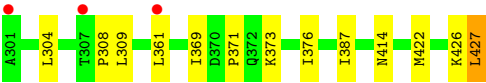


- Molecule 1: Acetyl-CoA acetyltransferase



- Molecule 1: Acetyl-CoA acetyltransferase





4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	75.35Å 106.75Å 101.66Å 90.00° 103.06° 90.00°	Depositor
Resolution (Å)	73.32 – 1.85 73.32 – 1.85	Depositor EDS
% Data completeness (in resolution range)	100.0 (73.32-1.85) 99.9 (73.32-1.85)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	0.07	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.96 (at 1.86Å)	Xtriage
Refinement program	REFMAC 5.2.0019	Depositor
R, R_{free}	0.164 , 0.203 0.165 , 0.204	Depositor DCC
R_{free} test set	6668 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å ²)	19.2	Xtriage
Anisotropy	0.059	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.37 , 60.0	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	13011	wwPDB-VP
Average B, all atoms (Å ²)	25.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.08% 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: CSO, MES, CL, K, COA, GOL

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	0.73	0/2991	0.83	1/4048 (0.0%)
1	B	0.75	1/3014 (0.0%)	0.82	1/4082 (0.0%)
1	C	0.53	0/2946	0.83	0/3984
1	D	0.53	0/2929	0.82	1/3962 (0.0%)
All	All	0.64	1/11880 (0.0%)	0.83	3/16076 (0.0%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	264	VAL	CA-CB	8.52	1.58	1.54

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	D	387	ILE	N-CA-C	5.40	116.12	110.62
1	A	387	ILE	N-CA-C	5.39	116.12	110.62
1	B	386	PRO	N-CA-C	-5.07	102.02	112.47

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	2913	0	3005	17	0
1	B	2921	0	3027	20	0
1	C	2900	0	2994	19	0
1	D	2891	0	2980	22	0
2	A	1	0	0	0	0
2	B	1	0	0	0	0
2	C	1	0	0	0	0
2	D	1	0	0	0	0
3	A	1	0	0	0	0
3	B	1	0	0	0	0
3	C	1	0	0	0	0
3	D	1	0	0	0	0
4	A	48	0	32	3	0
4	B	48	0	32	2	0
4	C	48	0	32	1	0
4	D	48	0	32	1	0
5	A	12	0	12	2	0
6	A	6	0	8	0	0
6	B	6	0	8	0	0
7	A	410	0	0	4	0
7	B	376	0	0	3	0
7	C	176	0	0	0	0
7	D	200	0	0	0	0
All	All	13011	0	12162	76	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 (76) 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:B:108[A]:VAL:HG21	1:B:119:CYS:SG	1.99	1.01
1:B:48[A]:THR:HG22	7:B:6191:HOH:O	1.81	0.81
1:B:39:LEU:HD13	1:B:141:MET:HE2	1.67	0.75
1:A:48[A]:THR:HG22	7:A:6155:HOH:O	1.89	0.71
1:B:395:VAL:O	1:B:399[B]:THR:HG23	1.96	0.66
1:A:395:VAL:O	1:A:399[B]:THR:HG23	2.00	0.61
4:A:6001:COA:O5A	5:A:5001:MES:H52	2.02	0.59
1:A:336[A]:VAL:HG11	1:A:423:LEU:HB2	1.84	0.59
1:B:108[A]:VAL:CG2	1:B:119:CYS:SG	2.84	0.57
1:D:373:LYS:C	1:D:376:ILE:HD11	2.29	0.57
1:B:45[B]:VAL:HG21	1:B:296:MET:HE3	1.88	0.55

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:76:ILE:CD1	1:D:113:LEU:HD11	2.37	0.54
1:B:76:ILE:CD1	1:B:113[A]:LEU:HD11	2.38	0.54
1:B:168[B]:THR:HG21	1:C:163:MET:HE3	1.90	0.52
1:D:210:GLU:HG2	1:D:361:LEU:HD13	1.91	0.52
1:B:270:VAL:HG11	7:B:6317:HOH:O	2.07	0.52
1:C:308:PRO:HB2	1:C:427:LEU:HD23	1.92	0.51
1:A:163:MET:SD	1:D:163:MET:HE1	2.51	0.50
1:A:313:VAL:HG12	1:A:340:VAL:HG11	1.94	0.50
1:D:51:PRO:HD3	1:D:236:ILE:O	2.13	0.49
4:A:6001:COA:H52A	7:A:6243:HOH:O	2.11	0.49
1:C:163:MET:HE2	1:D:175:LEU:HD12	1.95	0.48
1:D:84:GLU:H	1:D:84:GLU:CD	2.20	0.48
1:C:115:ILE:H	1:C:115:ILE:HD13	1.78	0.48
1:D:163:MET:HE2	1:D:175:LEU:HD21	1.95	0.48
1:A:76:ILE:CD1	1:A:113:LEU:HD11	2.43	0.48
1:B:81:ILE:HG21	1:B:296:MET:HE1	1.96	0.48
1:D:125:VAL:HB	1:D:414:ASN:HB2	1.96	0.48
4:B:6002:COA:H52A	7:B:6317:HOH:O	2.13	0.48
1:B:39:LEU:HD13	1:B:141:MET:CE	2.41	0.48
1:B:354:GLU:HB3	1:B:381:VAL:HG23	1.95	0.48
1:B:259:VAL:HG23	4:B:6002:COA:H61A	1.79	0.47
1:A:309:LEU:O	1:A:426:LYS:HD2	2.15	0.47
1:A:354:GLU:HG2	1:A:360:VAL:HG21	1.96	0.47
1:B:193:MET:HA	1:B:193:MET:HE2	1.98	0.46
1:C:354:GLU:HB3	1:C:381:VAL:HG23	1.98	0.46
1:D:309:LEU:O	1:D:426:LYS:HD2	2.15	0.46
1:C:354:GLU:HG2	1:C:360:VAL:HG21	1.97	0.46
1:D:373:LYS:CA	1:D:376:ILE:HD11	2.46	0.46
1:A:336[A]:VAL:CG1	1:A:423:LEU:HB2	2.46	0.45
1:C:259:VAL:HG23	4:C:6003:COA:H61A	1.81	0.45
1:A:354:GLU:HB3	1:A:381:VAL:HG23	1.98	0.45
1:B:354:GLU:HG2	1:B:360:VAL:HG21	1.99	0.45
1:D:163:MET:CE	1:D:175:LEU:HD21	2.46	0.45
1:A:358:LEU:C	1:A:358:LEU:HD13	2.42	0.44
1:D:259:VAL:HG23	4:D:6004:COA:H61A	1.83	0.44
1:C:122:ILE:HD11	1:D:135:MET:HE1	2.00	0.44
1:C:200:THR:HB	1:C:358:LEU:HD11	1.98	0.44
1:A:73:GLN:NE2	7:A:6294:HOH:O	2.50	0.44
1:B:105:ARG:HA	1:B:108[A]:VAL:HG22	2.00	0.43
1:A:77[B]:GLU:HG3	7:A:6122:HOH:O	2.17	0.43
1:D:373:LYS:HA	1:D:376:ILE:HD11	1.99	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:125:VAL:HB	1:A:414:ASN:HB2	2.01	0.43
5:A:5001:MES:H62	1:C:170:TYR:CE2	2.55	0.42
1:D:135:MET:HA	1:D:138:GLN:HE21	1.84	0.42
1:C:216:ILE:HG23	1:C:261:PHE:CE2	2.54	0.42
1:D:242:VAL:HB	1:D:245:GLN:HB2	2.00	0.42
1:B:199:ASN:ND2	1:B:203:LYS:HE2	2.34	0.42
1:D:133:ILE:HG22	1:D:422:MET:HE1	2.00	0.42
1:A:193:MET:HE2	1:A:193:MET:HA	2.02	0.42
1:D:308:PRO:HG2	1:D:427:LEU:HD23	2.01	0.42
1:B:48[A]:THR:CG2	1:B:75:ALA:HA	2.50	0.41
1:C:269:THR:HG21	1:C:276:GLY:C	2.46	0.41
1:C:87:LYS:O	1:C:118:PRO:HD2	2.21	0.41
1:C:403:LYS:O	1:C:404:GLN:C	2.63	0.41
1:C:328:ALA:N	1:C:329:PRO:CD	2.83	0.41
1:A:259:VAL:HG23	4:A:6001:COA:H61A	1.85	0.41
1:D:207:ALA:O	1:D:211:GLN:HG3	2.20	0.41
1:D:369:ILE:O	1:D:371:PRO:HD3	2.20	0.41
1:A:242:VAL:HB	1:A:245:GLN:HB2	2.02	0.41
1:B:358:LEU:C	1:B:358:LEU:HD13	2.46	0.41
1:C:135:MET:HE3	1:D:90:TYR:CZ	2.55	0.41
1:C:163:MET:HB2	1:C:175:LEU:HD22	2.02	0.41
1:C:402:LEU:HB2	1:C:426:LYS:HG3	2.03	0.40
1:C:262:SER:O	1:C:266:LYS:HE2	2.21	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	399/395 (101%)	395 (99%)	3 (1%)	1 (0%)	36	25
1	B	402/395 (102%)	396 (98%)	5 (1%)	1 (0%)	43	31

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	C	393/395 (100%)	382 (97%)	10 (2%)	1 (0%)	36	25
1	D	391/395 (99%)	383 (98%)	7 (2%)	1 (0%)	36	25
All	All	1585/1580 (100%)	1556 (98%)	25 (2%)	4 (0%)	36	25

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	125	VAL
1	B	125	VAL
1	C	125	VAL
1	D	125	VAL

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	316/308 (103%)	313 (99%)	3 (1%)	70	64
1	B	319/308 (104%)	317 (99%)	2 (1%)	78	73
1	C	310/308 (101%)	303 (98%)	7 (2%)	44	30
1	D	308/308 (100%)	299 (97%)	9 (3%)	37	22
All	All	1253/1232 (102%)	1232 (98%)	21 (2%)	55	42

All (21) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	125	VAL
1	A	175	LEU
1	A	358	LEU
1	B	125	VAL
1	B	389	MET
1	C	115	ILE
1	C	125	VAL
1	C	238	VAL

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Mol	Chain	Res	Type
1	C	270	VAL
1	C	274	GLU
1	C	426	LYS
1	C	427	LEU
1	D	78	LYS
1	D	84	GLU
1	D	125	VAL
1	D	162[A]	VAL
1	D	162[B]	VAL
1	D	174	LYS
1	D	175	LEU
1	D	304	LEU
1	D	427	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (21) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	73	GLN
1	A	93	ASN
1	A	372	GLN
1	B	93	ASN
1	B	101	GLN
1	B	138	GLN
1	B	199	ASN
1	B	275	ASN
1	C	93	ASN
1	C	101	GLN
1	C	199	ASN
1	C	353	ASN
1	C	372	GLN
1	C	377	ASN
1	D	93	ASN
1	D	101	GLN
1	D	138	GLN
1	D	199	ASN
1	D	272	GLN
1	D	372	GLN
1	D	377	ASN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

4 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	CSO	A	126	1	3,6,7	0.60	0	1,6,8	1.09	0
1	CSO	D	126	1	3,6,7	0.61	0	1,6,8	0.62	0
1	CSO	C	126	1	3,6,7	0.67	0	1,6,8	0.07	0
1	CSO	B	126	1	3,6,7	0.61	0	1,6,8	0.72	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
1	CSO	A	126	1	-	0/1/5/7	-
1	CSO	D	126	1	-	0/1/5/7	-
1	CSO	C	126	1	-	0/1/5/7	-
1	CSO	B	126	1	-	0/1/5/7	-

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 15 ligands modelled in this entry, 8 are monoatomic - leaving 7 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$
5	MES	A	5001	-	12,12,12	2.39	1 (8%)	15,16,16	2.42	6 (40%)
6	GOL	A	4001	-	5,5,5	0.38	0	5,5,5	0.28	0
6	GOL	B	4002	-	5,5,5	0.39	0	5,5,5	0.32	0
4	COA	C	6003	-	47,50,50	1.71	7 (14%)	69,75,75	1.45	6 (8%)
4	COA	B	6002	-	47,50,50	1.67	7 (14%)	69,75,75	1.54	8 (11%)
4	COA	A	6001	-	47,50,50	1.69	8 (17%)	69,75,75	1.50	8 (11%)
4	COA	D	6004	-	47,50,50	1.73	8 (17%)	69,75,75	1.46	6 (8%)

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	MES	A	5001	-	-	1/6/14/14	0/1/1/1
6	GOL	A	4001	-	-	1/4/4/4	-
6	GOL	B	4002	-	-	4/4/4/4	-
4	COA	C	6003	-	-	3/48/64/64	0/3/3/3
4	COA	B	6002	-	-	3/48/64/64	0/3/3/3
4	COA	A	6001	-	-	4/48/64/64	0/3/3/3
4	COA	D	6004	-	-	5/48/64/64	0/3/3/3

All (31) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	A	5001	MES	C8-S	-7.98	1.66	1.77
4	C	6003	COA	P3B-O7A	6.54	1.70	1.50
4	B	6002	COA	P3B-O7A	6.53	1.70	1.50
4	D	6004	COA	P3B-O7A	6.50	1.70	1.50
4	A	6001	COA	P3B-O7A	6.45	1.70	1.50
4	C	6003	COA	C5A-C4A	4.26	1.46	1.39
4	C	6003	COA	P3B-O8A	4.25	1.70	1.54
4	D	6004	COA	P3B-O8A	4.23	1.70	1.54
4	A	6001	COA	P3B-O8A	4.18	1.70	1.54
4	A	6001	COA	C5A-C4A	4.17	1.46	1.39
4	D	6004	COA	C5A-C4A	4.12	1.46	1.39
4	B	6002	COA	C5A-C4A	4.05	1.46	1.39
4	B	6002	COA	P3B-O8A	3.91	1.69	1.54
4	C	6003	COA	P1A-O2A	3.37	1.71	1.55
4	D	6004	COA	P1A-O2A	3.36	1.70	1.55
4	A	6001	COA	P1A-O2A	3.30	1.70	1.55
4	D	6004	COA	P2A-O5A	3.29	1.70	1.55
4	B	6002	COA	P1A-O2A	3.24	1.70	1.55
4	A	6001	COA	C5A-N7A	-3.23	1.33	1.39
4	C	6003	COA	P2A-O5A	3.22	1.70	1.55
4	B	6002	COA	C5A-N7A	-3.17	1.33	1.39
4	B	6002	COA	P2A-O5A	3.11	1.69	1.55
4	D	6004	COA	C5A-N7A	-3.10	1.33	1.39
4	A	6001	COA	P2A-O5A	3.00	1.69	1.55
4	C	6003	COA	C5A-N7A	-2.99	1.33	1.39
4	C	6003	COA	C5A-C6A	2.76	1.48	1.41
4	D	6004	COA	C5A-C6A	2.67	1.48	1.41
4	A	6001	COA	C5A-C6A	2.51	1.48	1.41
4	B	6002	COA	C5A-C6A	2.49	1.47	1.41
4	D	6004	COA	P2A-O3A	2.09	1.61	1.59
4	A	6001	COA	C8A-N7A	2.00	1.35	1.31

All (34) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	D	6004	COA	C5A-C4A-N3A	-6.18	118.21	126.72
4	B	6002	COA	C5A-C4A-N3A	-6.15	118.24	126.72
4	A	6001	COA	C5A-C4A-N3A	-6.09	118.34	126.72
4	B	6002	COA	N3A-C4A-N9A	6.06	137.47	127.17
4	C	6003	COA	C5A-C4A-N3A	-6.05	118.38	126.72
4	A	6001	COA	N3A-C4A-N9A	6.05	137.46	127.17
4	D	6004	COA	N3A-C4A-N9A	5.96	137.31	127.17
5	A	5001	MES	C5-N4-C3	5.96	121.68	108.84

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	C	6003	COA	N3A-C4A-N9A	5.92	137.23	127.17
4	B	6002	COA	C2A-N3A-C4A	3.74	120.95	111.83
4	C	6003	COA	C2A-N3A-C4A	3.52	120.43	111.83
4	D	6004	COA	C2A-N3A-C4A	3.51	120.40	111.83
4	B	6002	COA	N3A-C2A-N1A	-3.49	123.31	128.58
4	A	6001	COA	C2A-N3A-C4A	3.38	120.08	111.83
4	A	6001	COA	C4A-N9A-C8A	3.26	109.16	105.74
5	A	5001	MES	C7-N4-C5	3.25	119.91	111.24
4	B	6002	COA	C4A-N9A-C8A	3.25	109.15	105.74
5	A	5001	MES	C6-C5-N4	-3.18	105.29	110.12
4	C	6003	COA	N3A-C2A-N1A	-3.14	123.83	128.58
4	D	6004	COA	N3A-C2A-N1A	-3.08	123.93	128.58
4	C	6003	COA	C4A-N9A-C8A	3.06	108.95	105.74
4	D	6004	COA	C4A-N9A-C8A	2.87	108.75	105.74
4	A	6001	COA	N3A-C2A-N1A	-2.87	124.24	128.58
5	A	5001	MES	C7-N4-C3	2.69	118.41	111.24
5	A	5001	MES	C2-C3-N4	-2.55	106.25	110.12
4	B	6002	COA	O2A-P1A-O3A	2.37	113.69	107.27
4	B	6002	COA	C2A-N1A-C6A	2.23	122.39	118.73
4	A	6001	COA	C7P-C6P-C5P	-2.22	108.69	112.39
4	C	6003	COA	C2A-N1A-C6A	2.13	122.22	118.73
4	A	6001	COA	N6A-C6A-N1A	2.11	123.07	118.38
5	A	5001	MES	O3S-S-C8	2.09	110.10	106.00
4	D	6004	COA	C2A-N1A-C6A	2.06	122.12	118.73
4	A	6001	COA	O2A-P1A-O3A	2.05	112.80	107.27
4	B	6002	COA	N9A-C8A-N7A	-2.03	111.06	113.94

There are no chirality outliers.

All (21) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	C	6003	COA	S1P-C2P-C3P-N4P
6	B	4002	GOL	O1-C1-C2-C3
6	B	4002	GOL	C1-C2-C3-O3
6	B	4002	GOL	O1-C1-C2-O2
5	A	5001	MES	C8-C7-N4-C3
4	A	6001	COA	P2A-O3A-P1A-O1A
4	B	6002	COA	P2A-O3A-P1A-O1A
4	C	6003	COA	P2A-O3A-P1A-O1A
4	D	6004	COA	P2A-O3A-P1A-O1A
6	B	4002	GOL	O2-C2-C3-O3
4	A	6001	COA	S1P-C2P-C3P-N4P

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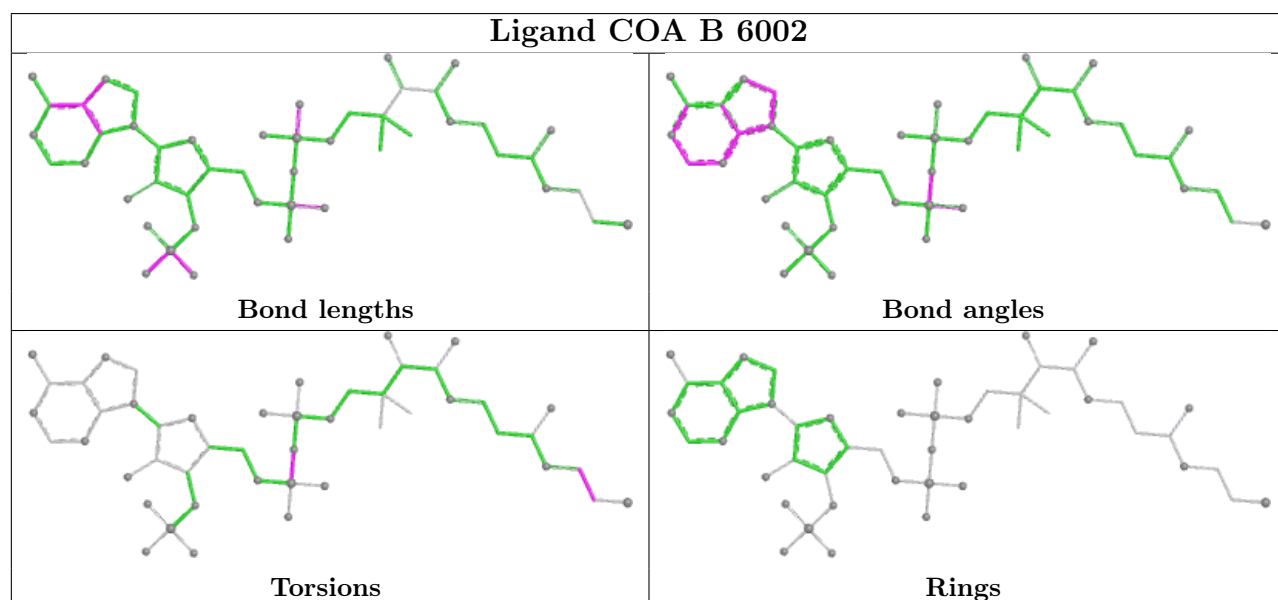
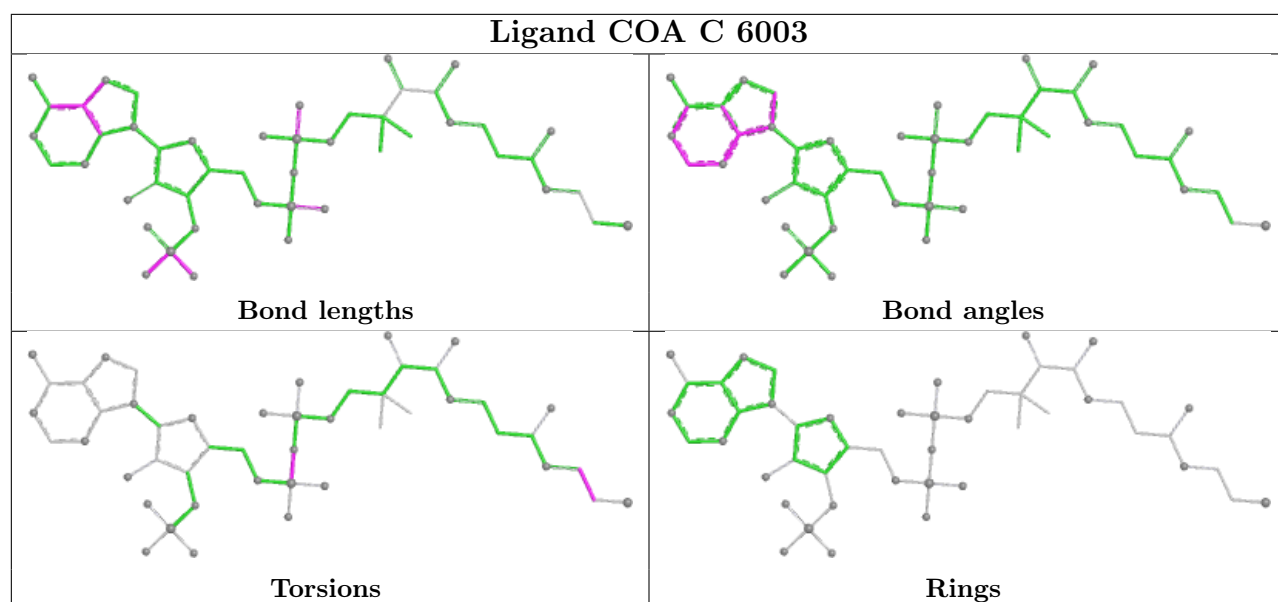
Mol	Chain	Res	Type	Atoms
4	B	6002	COA	S1P-C2P-C3P-N4P
4	D	6004	COA	S1P-C2P-C3P-N4P
4	D	6004	COA	C3B-O3B-P3B-O8A
6	A	4001	GOL	O2-C2-C3-O3
4	A	6001	COA	P2A-O3A-P1A-O2A
4	B	6002	COA	P2A-O3A-P1A-O2A
4	C	6003	COA	P2A-O3A-P1A-O2A
4	D	6004	COA	P2A-O3A-P1A-O2A
4	A	6001	COA	CEP-CBP-CCP-O6A
4	D	6004	COA	C3B-O3B-P3B-O7A

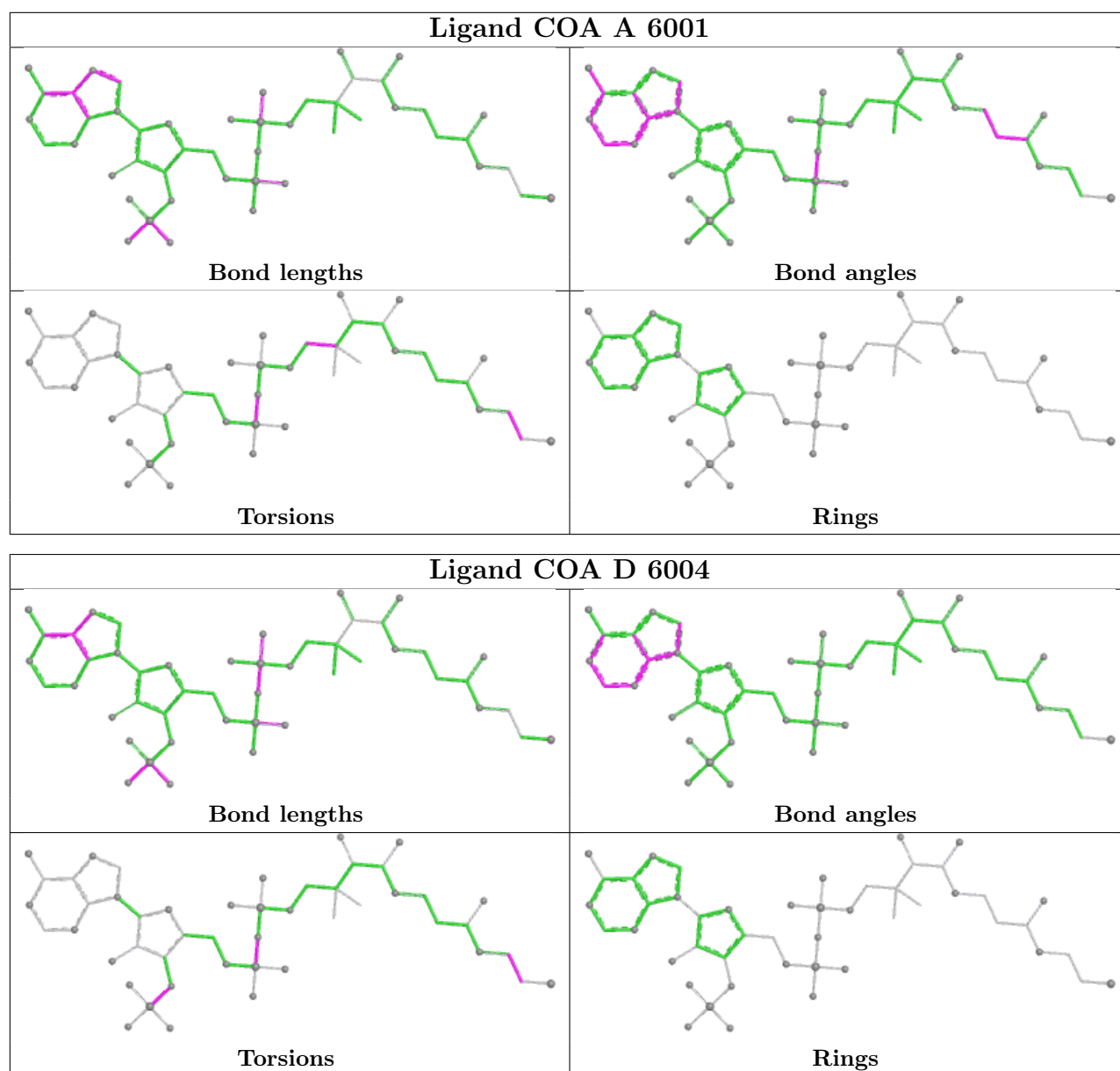
There are no ring outliers.

5 monomers are involved in 8 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	A	5001	MES	2	0
4	C	6003	COA	1	0
4	B	6002	COA	2	0
4	A	6001	COA	3	0
4	D	6004	COA	1	0

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





5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data

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	390/395 (98%)	-0.55	4 (1%) 79 83	7, 14, 27, 56	25 (6%)
1	B	390/395 (98%)	-0.43	4 (1%) 79 83	6, 15, 28, 53	34 (8%)
1	C	392/395 (99%)	0.56	20 (5%) 33 36	13, 30, 47, 70	23 (5%)
1	D	392/395 (99%)	0.57	14 (3%) 46 50	17, 28, 44, 65	32 (8%)
All	All	1564/1580 (98%)	0.04	42 (2%) 56 59	6, 22, 43, 70	114 (7%)

All (42) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	373	LYS	3.8
1	A	37	PRO	3.8
1	D	273	LYS	3.4
1	D	271	PHE	3.4
1	D	270	VAL	3.2
1	C	242	VAL	3.1
1	D	243	LYS	3.1
1	B	173	VAL	3.0
1	B	243	LYS	3.0
1	D	242	VAL	3.0
1	B	246	PRO	3.0
1	C	246	PRO	3.0
1	A	244	GLY	2.9
1	C	244	GLY	2.9
1	C	248	VAL	2.8
1	D	268	LYS	2.6
1	C	227	GLU	2.6
1	D	194	GLY	2.6
1	C	407	TYR	2.5
1	C	238	VAL	2.5
1	C	270	VAL	2.4

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Mol	Chain	Res	Type	RSRZ
1	C	348	ALA	2.3
1	D	307	THR	2.3
1	C	275	ASN	2.3
1	D	80	GLY	2.3
1	C	173	VAL	2.3
1	C	274	GLU	2.3
1	C	233	ASN	2.3
1	C	259	VAL	2.2
1	C	342	LEU	2.2
1	D	241	THR	2.2
1	D	217	ASN	2.1
1	C	340	VAL	2.1
1	C	352	VAL	2.1
1	C	309	LEU	2.1
1	C	245	GLN	2.1
1	D	228	ALA	2.1
1	D	301	ALA	2.1
1	A	246	PRO	2.0
1	D	361	LEU	2.0
1	B	244	GLY	2.0
1	A	270	VAL	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($\text{\AA}^2$)	Q<0.9
1	CSO	D	126	7/8	0.94	0.08	20,21,26,32	0
1	CSO	C	126	7/8	0.95	0.07	19,20,24,28	0
1	CSO	B	126	7/8	0.96	0.07	10,11,20,23	0
1	CSO	A	126	7/8	0.97	0.05	8,10,17,21	0

6.3 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

6.4 Ligands

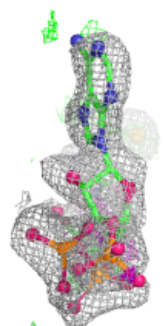
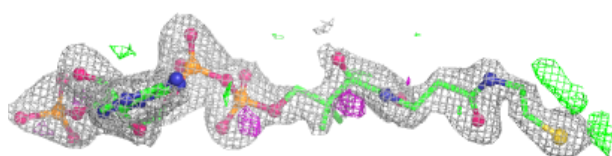
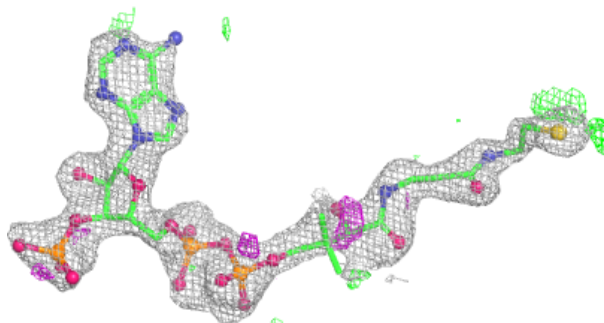
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
5	MES	A	5001	12/12	0.73	0.26	75,76,76,76	4
4	COA	D	6004	48/48	0.82	0.14	40,59,62,63	1
6	GOL	B	4002	6/6	0.85	0.14	40,41,41,41	6
4	COA	C	6003	48/48	0.87	0.12	29,50,55,56	1
6	GOL	A	4001	6/6	0.88	0.11	30,33,34,35	0
4	COA	B	6002	48/48	0.89	0.10	27,33,43,44	0
4	COA	A	6001	48/48	0.90	0.10	20,35,45,46	1
2	CL	D	2003	1/1	0.91	0.12	55,55,55,55	0
2	CL	C	2004	1/1	0.91	0.14	54,54,54,54	0
2	CL	B	2001	1/1	0.92	0.10	43,43,43,43	0
3	K	C	3003	1/1	0.97	0.06	28,28,28,28	0
2	CL	A	2002	1/1	0.97	0.08	43,43,43,43	0
3	K	D	3004	1/1	0.99	0.06	26,26,26,26	0
3	K	B	3002	1/1	0.99	0.03	15,15,15,15	0
3	K	A	3001	1/1	1.00	0.01	12,12,12,12	0

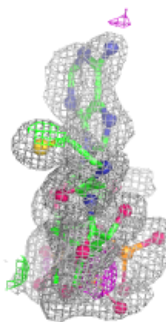
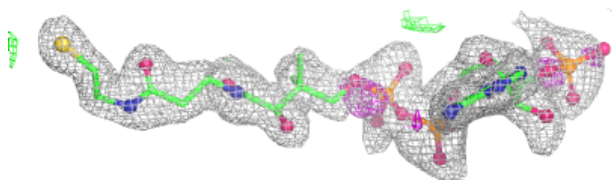
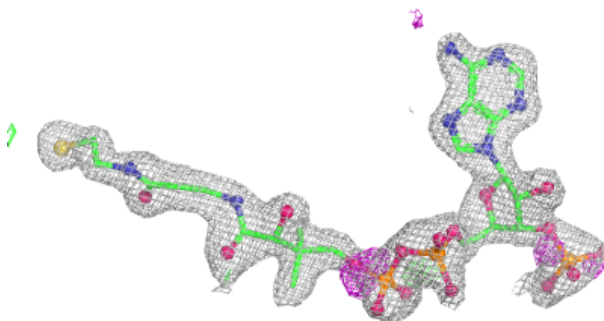
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

Electron density around COA D 6004:

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

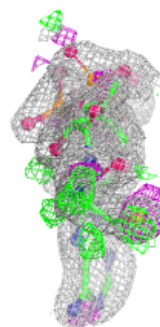
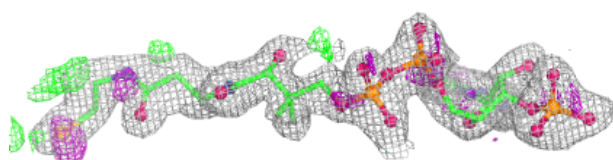
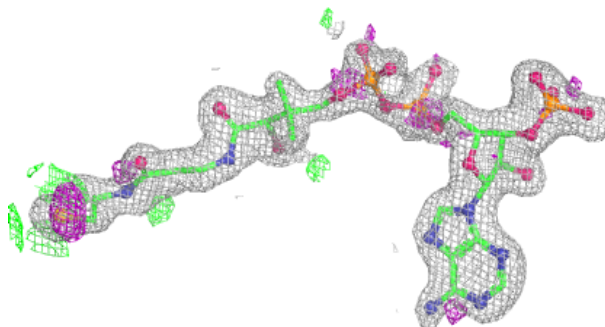
**Electron density around COA C 6003:**

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

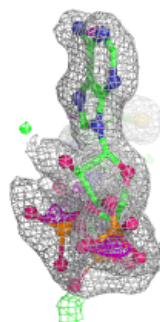
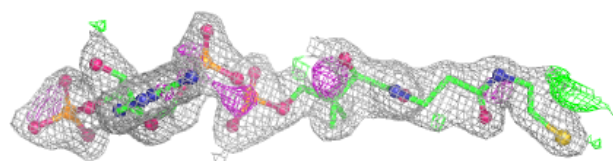
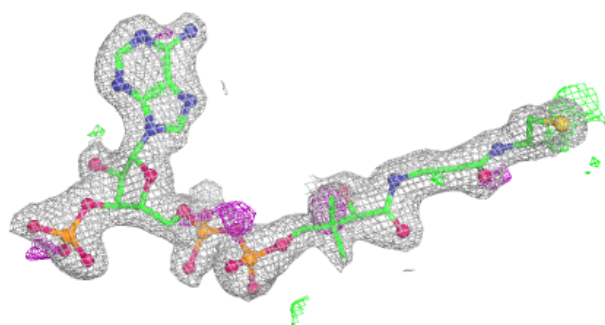


Electron density around COA B 6002:

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

**Electron density around COA A 6001:**

$2mF_o-DF_c$ (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.