W O R L D W I D E
wwPDB
PROTEIN DATA BANK

Full wwPDB X-ray Structure Validation Report ⓘ

Mar 13, 2024 – 06:18 PM EDT

PDB ID	:	8VLQ
Title	:	Structure of PmHMGR bound to mevalonate, CoA and NAD 5 minutes after reaction initiation at pH 9
Authors	:	Purohit, V.; Steussy, C.N.; Stauffacher, C.V.
Deposited on	:	2024-01-12
Resolution	:	2.07 Å(reported)

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	:	2.36
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)	:	2.36

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 2.07 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	Percentile Ranks	Value
Rfree		0.250
Clashscore		4
Ramachandran outliers		0.1%
Sidechain outliers		1.2%
RSRZ outliers		4.4%

Worse   *Better*

▮ Percentile relative to all X-ray structures

▯ Percentile relative to X-ray structures of similar resolution
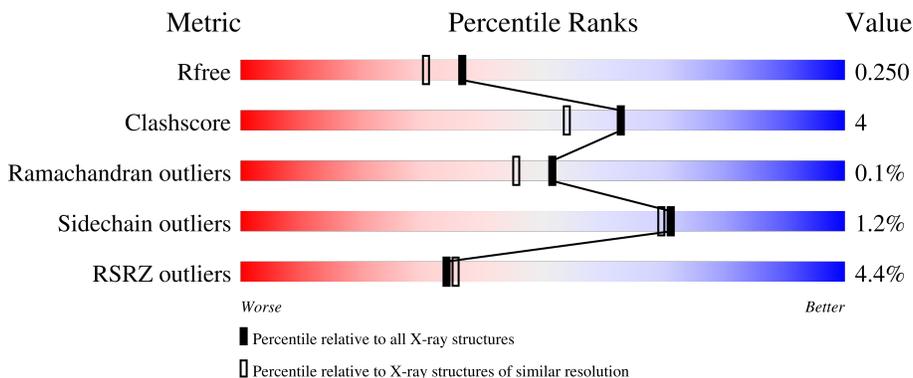
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	2684 (2.08-2.04)
Clashscore	141614	2801 (2.08-2.04)
Ramachandran outliers	138981	2768 (2.08-2.04)
Sidechain outliers	138945	2768 (2.08-2.04)
RSRZ outliers	127900	2646 (2.08-2.04)

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 <=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	428	5% / 86% / 12% / •
1	B	428	3% / 80% / 7% / 12%

2 Entry composition ⓘ

There are 9 unique types of molecules in this entry. The entry contains 6590 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 3-hydroxy-3-methylglutaryl-coenzyme A reductase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	421	Total	C	N	O	S	0	3	0
			3151	1967	578	590	16			
1	B	375	Total	C	N	O	S	0	1	0
			2791	1748	504	525	14			

- Molecule 2 is Mevaldyl-Coenzyme A (three-letter code: ZKE) (formula: $C_{27}H_{46}N_7O_{20}P_3S$) (labeled as "Ligand of Interest" by depositor).
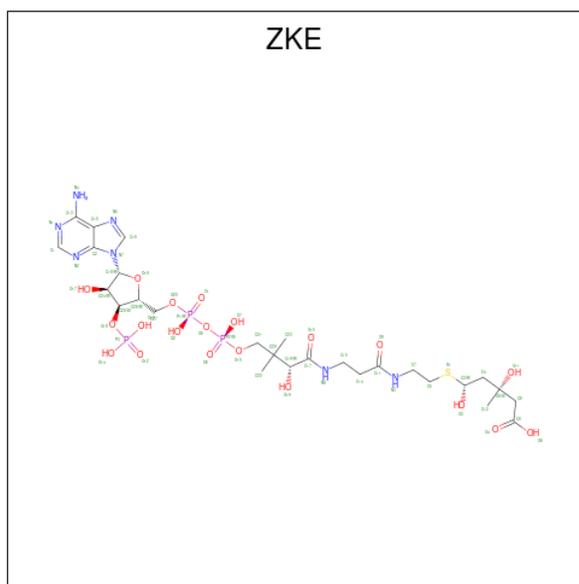

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf
2	A	1	Total	C	N	O	P	S	0	1
			58	27	7	20	3	1		

- Molecule 3 is COENZYME A (three-letter code: COA) (formula: $C_{21}H_{36}N_7O_{16}P_3S$) (labeled as "Ligand of Interest" by depositor).

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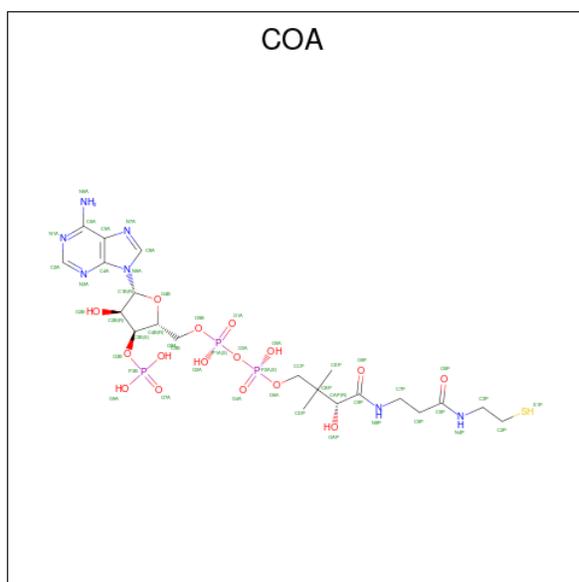
Mol	Chain	Residues	Atoms						ZeroOcc	AltConf
			Total	C	N	O	P	S		
3	A	1	48	21	7	16	3	1	0	1

- Molecule 4 is (R)-mevaldehyde (three-letter code: A1AFY) (formula: $C_6H_{10}O_4$) (labeled as "Ligand of Interest" by depositor).


A1AFY
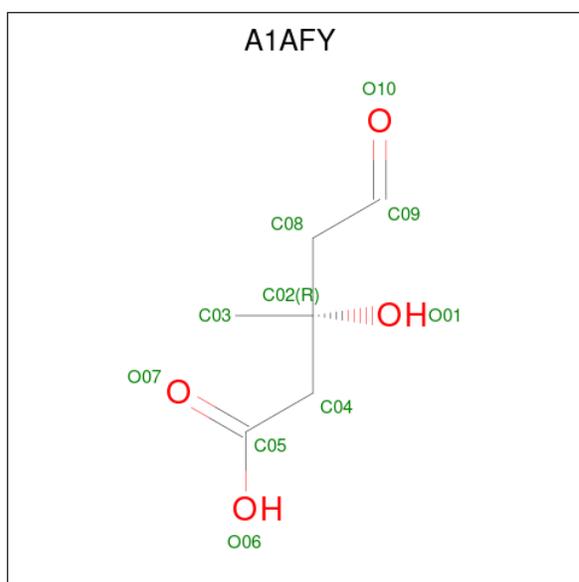
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
			Total	C	O		
4	A	1	10	6	4	0	1

- Molecule 5 is SULFATE ION (three-letter code: SO4) (formula: O_4S) (labeled as "Ligand of Interest" by depositor).

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

- Molecule 6 is NICOTINAMIDE-ADENINE-DINUCLEOTIDE (three-letter code: NAD) (formula: $C_{21}H_{27}N_7O_{14}P_2$) (labeled as "Ligand of Interest" by depositor).


Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	P		
6	B	1	44	21	7	14	2	0	1

- Molecule 7 is 1,4-DIHYDRONICOTINAMIDE ADENINE DINUCLEOTIDE (three-letter code: NAI) (formula: $C_{21}H_{29}N_7O_{14}P_2$) (labeled as "Ligand of Interest" by depositor).

NAI
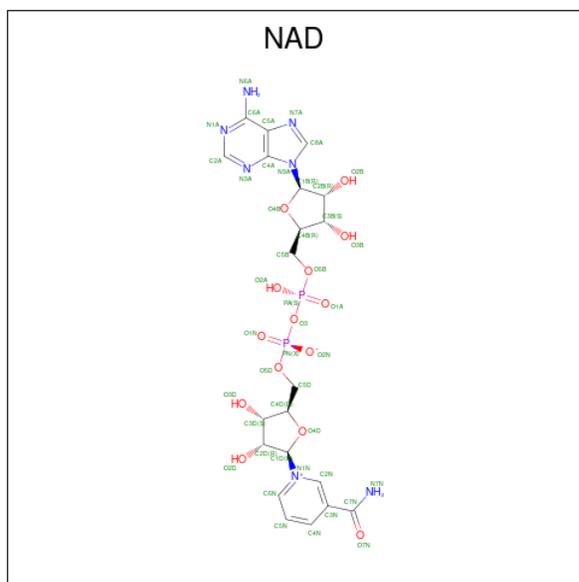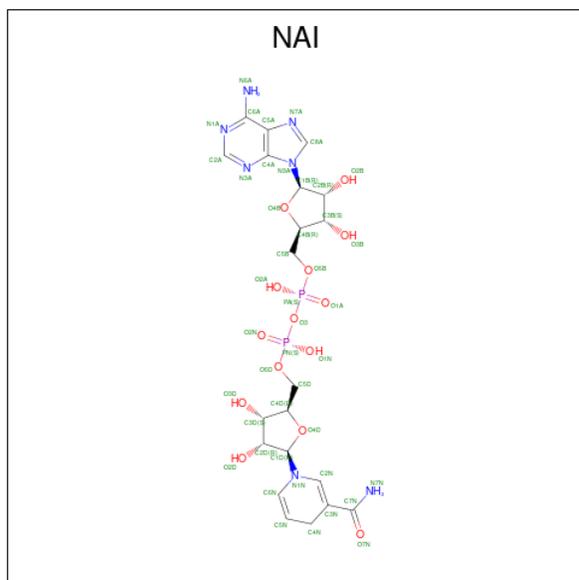
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
7	B	1	Total	C	N	O	P	0	1
			44	21	7	14	2		

- Molecule 8 is (R)-MEVALONATE (three-letter code: MEV) (formula: $C_6H_{11}O_4$) (labeled as "Ligand of Interest" by depositor).

MEV
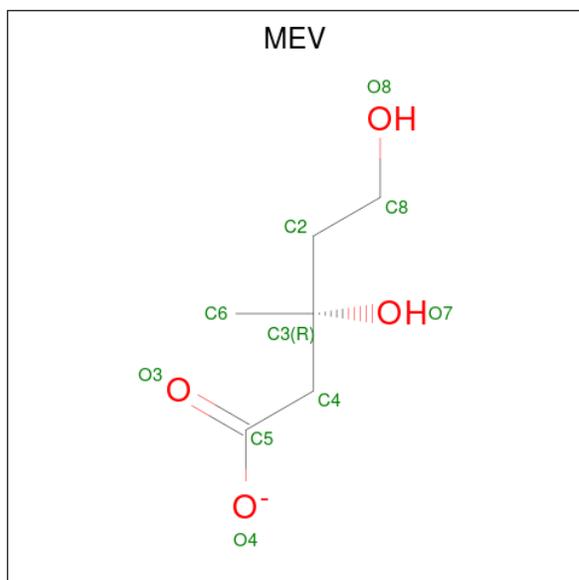
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
8	B	1	Total	C	O	0	0
			10	6	4		

- Molecule 9 is water.

| Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
9	A	227	Total 227	O 227	0	0
9	B	202	Total 202	O 202	0	0

3 Residue-property plots ⓘ

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: 3-hydroxy-3-methylglutaryl-coenzyme A reductase
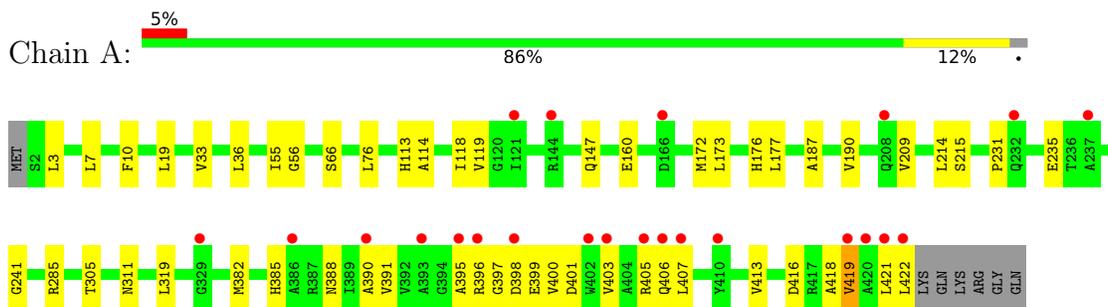
- Molecule 1: 3-hydroxy-3-methylglutaryl-coenzyme A reductase
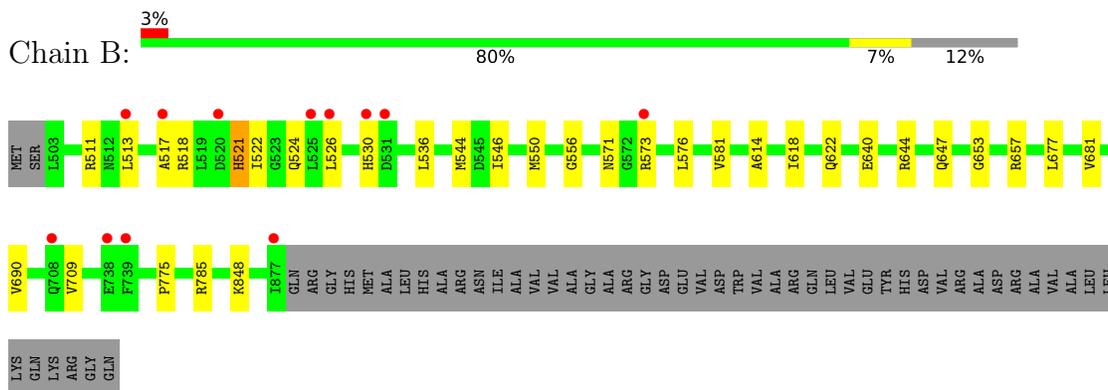
4 Data and refinement statistics ⓘ

Property	Value	Source
Space group	I 41 3 2	Depositor
Cell constants a, b, c, α, β, γ	225.99Å 225.99Å 225.99Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	48.18 – 2.07 48.18 – 2.07	Depositor EDS
% Data completeness (in resolution range)	98.7 (48.18-2.07) 98.7 (48.18-2.07)	Depositor EDS
R_{merge}	0.11	Depositor
R_{sym}	0.11	Depositor
$< I/\sigma(I) >$ [1]	7.36 (at 2.07Å)	Xtriage
Refinement program	PHENIX 1.19.2_4158	Depositor
R, R_{free}	0.215 , 0.248 0.220 , 0.250	Depositor DCC
R_{free} test set	2994 reflections (5.05%)	wwPDB-VP
Wilson B-factor (Å^2)	23.3	Xtriage
Anisotropy	0.000	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.33 , 55.9	EDS
L-test for twinning[2]	$< |L| > = 0.50, < L^2 > = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.94	EDS
Total number of atoms	6590	wwPDB-VP
Average B, all atoms (Å^2)	34.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.04% of the height of the origin peak. No significant pseudotranslation is detected.*

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[1]Intensities estimated from amplitudes.
[2]Theoretical values of $< |L| >$, $< L^2 >$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5   Model quality ⓘ

5.1   Standard geometry ⓘ

Bond lengths and bond angles in the following residue types are not validated in this section: COA, ZKE, MEV, NAD, A1AFY, NAI, SO4

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	0.27	0/3200	0.53	0/4353
1	B	0.26	0/2834	0.52	0/3855
All	All	0.26	0/6034	0.52	0/8208

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

5.2   Too-close contacts ⓘ

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	3151	0	3174	36	0
1	B	2791	0	2832	21	0
2	A	58	0	0	0	0
3	A	48	0	32	1	0
4	A	10	0	0	0	0
5	A	5	0	0	0	0
6	B	44	0	25	1	0
7	B	44	0	27	0	0
8	B	10	0	11	0	0
9	A	227	0	0	3	0
9	B	202	0	0	0	0
All	All	6590	0	6101	53	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 4.

All (53) 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[Y]:COA:O4B	3:A:502[Y]:COA:C1B	1.65	1.21
1:A:114:ALA:HB2	1:A:190:VAL:HB	1.72	0.71
1:A:235:GLU:HG2	1:A:241:GLY:H	1.56	0.71
1:A:395:ALA:HB1	1:A:399:GLU:HB2	1.76	0.67
1:A:416:ASP:OD2	1:B:647:GLN:N	2.26	0.65
1:A:388:ASN:ND2	9:A:603:HOH:O	2.27	0.61
1:A:187:ALA:HA	1:A:214:LEU:HD13	1.82	0.60
1:A:399:GLU:HB3	1:A:421:LEU:HD11	1.82	0.60
1:A:407:LEU:HD21	1:A:418:ALA:HB2	1.84	0.60
1:A:235:GLU:HG2	1:A:241:GLY:N	2.17	0.59
1:B:653:GLY:O	1:B:657:ARG:NH2	2.36	0.57
1:A:114:ALA:HB3	1:A:177:LEU:HB2	1.87	0.56
1:B:614:ALA:HB2	1:B:690:VAL:HB	1.89	0.55
1:B:521:HIS:O	1:B:524:GLN:N	2.39	0.54
1:A:118:ILE:HD12	1:A:173:LEU:HD22	1.90	0.54
1:A:160:GLU:HG2	1:A:176:HIS:HB2	1.90	0.54
1:B:618:ILE:HG12	1:B:709:VAL:HG22	1.90	0.54
1:A:55:ILE:HG22	1:B:518:ARG:HB3	1.91	0.53
1:A:419:VAL:HG22	1:A:422:LEU:HD13	1.91	0.53
1:A:391:VAL:HG13	1:A:396:ARG:CB	2.40	0.52
1:A:407:LEU:HD22	1:A:413:VAL:HA	1.93	0.51
1:A:147:GLN:NE2	9:A:611:HOH:O	2.45	0.50
1:A:390:ALA:HB3	1:A:400:VAL:HG23	1.92	0.50
1:A:118:ILE:HG12	1:A:209:VAL:HG22	1.93	0.50
1:B:518:ARG:O	1:B:522:ILE:HG12	2.11	0.50
1:A:416:ASP:OD2	1:B:647:GLN:HB2	2.12	0.50
1:B:571:ASN:HB2	1:B:573:ARG:HH12	1.77	0.49
1:B:614:ALA:HB3	1:B:677:LEU:HB2	1.95	0.48
1:B:681:VAL:O	6:B:1001[X]:NAD:H2A	2.14	0.48
1:A:311:ASN:OD1	9:A:601:HOH:O	2.19	0.47
1:A:19:LEU:HG	1:A:33:VAL:HG23	1.96	0.47
1:A:36:LEU:HD22	1:B:556:GLY:HA3	1.97	0.47
1:A:385:HIS:CE1	1:A:388:ASN:HD22	2.33	0.47
1:A:3:LEU:HD21	1:A:76:LEU:HD23	1.97	0.47
1:B:640:GLU:O	1:B:644:ARG:HG3	2.15	0.46
1:A:231:PRO:O	1:A:241:GLY:HA3	2.15	0.46
1:A:56:GLY:HA3	1:B:536:LEU:HD22	1.97	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:7:LEU:HD12	1:A:66:SER:HB3	1.98	0.45
1:A:400:VAL:HG22	1:A:401:ASP:H	1.82	0.45
1:A:7:LEU:HB3	1:A:10:PHE:HB2	1.99	0.45
1:A:119:VAL:HG12	1:A:172:MET:HG2	1.98	0.44
1:B:513:LEU:HG	1:B:517:ALA:HB3	1.99	0.44
1:B:511:ARG:O	1:B:518:ARG:NH2	2.38	0.43
1:B:546:ILE:O	1:B:550:MET:HG3	2.18	0.43
1:A:382:MET:HB3	1:A:413:VAL:HB	2.00	0.43
1:B:848:LYS:HA	1:B:848:LYS:HD2	1.94	0.42
1:A:403:VAL:HA	1:A:406:GLN:HG2	2.02	0.42
1:B:526:LEU:HD11	1:B:576:LEU:HD12	2.01	0.42
1:A:305:THR:HG22	1:A:319:LEU:HB2	2.01	0.41
1:B:581:VAL:HB	1:B:775:PRO:HG3	2.03	0.41
1:B:622:GLN:O	1:B:622:GLN:HG3	2.21	0.40
1:A:113:HIS:HB2	1:A:215:SER:HB3	2.02	0.40
1:A:397:GLY:O	1:A:400:VAL:HG12	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	422/428 (99%)	401 (95%)	21 (5%)	0	100	100
1	B	374/428 (87%)	361 (96%)	12 (3%)	1 (0%)	41	32
All	All	796/856 (93%)	762 (96%)	33 (4%)	1 (0%)	51	45

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	521	HIS

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	322/327 (98%)	318 (99%)	4 (1%)	71	69
1	B	288/327 (88%)	285 (99%)	3 (1%)	76	75
All	All	610/654 (93%)	603 (99%)	7 (1%)	71	72

All (7) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	285	ARG
1	A	398	ASP
1	A	405	ARG
1	A	419	VAL
1	B	530	HIS
1	B	544	MET
1	B	785	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	147	GLN
1	A	188	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 monosaccharides in this entry.

5.6 Ligand geometry (i)

7 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
8	MEV	B	1003	-	8,9,9	1.27	1 (12%)	6,12,12	1.16	0
4	A1AFY	A	503[Z]	-	8,9,9	1.67	3 (37%)	7,12,12	1.20	0
5	SO4	A	504	-	4,4,4	0.14	0	6,6,6	0.06	0
6	NAD	B	1001[X]	-	42,48,48	4.76	19 (45%)	50,73,73	1.84	7 (14%)
3	COA	A	502[Y]	-	41,50,50	4.12	16 (39%)	52,75,75	1.99	7 (13%)
2	ZKE	A	501[X]	-	49,60,60	2.14	15 (30%)	63,90,90	1.48	10 (15%)
7	NAI	B	1002[Y]	-	42,48,48	1.36	7 (16%)	47,73,73	1.53	8 (17%)

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
8	MEV	B	1003	-	-	5/9/9/9	-
4	A1AFY	A	503[Z]	-	-	2/9/9/9	-
6	NAD	B	1001[X]	-	-	5/26/62/62	0/5/5/5
3	COA	A	502[Y]	-	-	6/44/64/64	0/3/3/3
2	ZKE	A	501[X]	-	-	6/55/77/77	0/3/3/3
7	NAI	B	1002[Y]	-	-	7/25/72/72	0/5/5/5

All (61) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	502[Y]	COA	O4B-C1B	17.58	1.65	1.41
6	B	1001[X]	NAD	C2B-C1B	-17.26	1.27	1.53
3	A	502[Y]	COA	C2B-C1B	-12.99	1.34	1.53
6	B	1001[X]	NAD	C2D-C3D	-10.34	1.25	1.53
6	B	1001[X]	NAD	C3B-C4B	-10.27	1.26	1.53
6	B	1001[X]	NAD	O4B-C1B	9.99	1.55	1.41
6	B	1001[X]	NAD	C7N-N7N	7.84	1.47	1.33
3	A	502[Y]	COA	C9P-N8P	7.12	1.49	1.33
6	B	1001[X]	NAD	O4D-C1D	6.75	1.50	1.41
3	A	502[Y]	COA	C5P-N4P	6.48	1.48	1.33
6	B	1001[X]	NAD	O4D-C4D	-6.44	1.30	1.45
2	A	501[X]	ZKE	O19-C18	6.36	1.50	1.41
3	A	502[Y]	COA	O4B-C4B	-6.16	1.31	1.45
2	A	501[X]	ZKE	C17-N6	5.43	1.45	1.33
2	A	501[X]	ZKE	C11-N3	5.33	1.45	1.33
6	B	1001[X]	NAD	C2B-C3B	5.23	1.67	1.53
6	B	1001[X]	NAD	C3D-C4D	5.02	1.65	1.53
6	B	1001[X]	NAD	O4B-C4B	4.57	1.55	1.45
6	B	1001[X]	NAD	O2D-C2D	3.95	1.52	1.43
6	B	1001[X]	NAD	C3N-C7N	3.87	1.56	1.50
6	B	1001[X]	NAD	C6A-N6A	3.83	1.48	1.34
6	B	1001[X]	NAD	C2D-C1D	3.70	1.59	1.53
6	B	1001[X]	NAD	O7N-C7N	-3.31	1.17	1.24
3	A	502[Y]	COA	C6A-N6A	3.28	1.46	1.34
2	A	501[X]	ZKE	P3-O18	3.17	1.65	1.59
2	A	501[X]	ZKE	C13-N4	3.16	1.45	1.34
2	A	501[X]	ZKE	C24-C18	-3.04	1.49	1.53
2	A	501[X]	ZKE	C24-C25	-3.03	1.46	1.52
7	B	1002[Y]	NAI	PA-O5B	3.03	1.71	1.59
4	A	503[Z]	A1AFY	O01-C02	-3.02	1.40	1.44
3	A	502[Y]	COA	P3B-O3B	3.01	1.65	1.59
3	A	502[Y]	COA	O3B-C3B	-2.99	1.33	1.44
2	A	501[X]	ZKE	C10-N5	2.93	1.50	1.39
7	B	1002[Y]	NAI	PN-O5D	2.90	1.71	1.59
2	A	501[X]	ZKE	O11-C6	-2.69	1.40	1.44
6	B	1001[X]	NAD	C2A-N3A	2.66	1.36	1.32
2	A	501[X]	ZKE	C1-N2	2.65	1.36	1.32
3	A	502[Y]	COA	C5A-C4A	-2.63	1.34	1.40
8	B	1003	MEV	O7-C3	-2.60	1.40	1.44
6	B	1001[X]	NAD	O3D-C3D	2.54	1.49	1.43
6	B	1001[X]	NAD	C5A-C4A	-2.49	1.34	1.40
4	A	503[Z]	A1AFY	C03-C02	2.34	1.55	1.52
7	B	1002[Y]	NAI	O3B-C3B	-2.29	1.37	1.43

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
7	B	1002[Y]	NAI	O3D-C3D	-2.28	1.37	1.43
3	A	502[Y]	COA	OAP-CAP	-2.25	1.38	1.42
3	A	502[Y]	COA	C3B-C4B	2.24	1.58	1.52
3	A	502[Y]	COA	P2A-O6A	2.24	1.68	1.59
2	A	501[X]	ZKE	O15-C17	-2.20	1.19	1.23
2	A	501[X]	ZKE	C13-C10	-2.18	1.35	1.43
7	B	1002[Y]	NAI	C2B-C1B	2.17	1.57	1.53
2	A	501[X]	ZKE	P3-O14	-2.17	1.46	1.54
2	A	501[X]	ZKE	P3-O13	-2.15	1.46	1.54
6	B	1001[X]	NAD	C5B-C4B	2.15	1.58	1.51
2	A	501[X]	ZKE	O9-C11	-2.13	1.18	1.23
3	A	502[Y]	COA	O2B-C2B	2.12	1.48	1.43
3	A	502[Y]	COA	O9P-C9P	-2.10	1.19	1.23
3	A	502[Y]	COA	C2A-N3A	2.09	1.35	1.32
3	A	502[Y]	COA	O5P-C5P	-2.08	1.19	1.23
7	B	1002[Y]	NAI	O2D-C2D	-2.06	1.38	1.43
7	B	1002[Y]	NAI	O4B-C4B	-2.02	1.40	1.45
4	A	503[Z]	A1AFY	C04-C05	2.00	1.56	1.50

All (32) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	502[Y]	COA	C5A-C6A-N6A	9.53	134.83	120.35
6	B	1001[X]	NAD	C5A-C6A-N6A	6.52	130.26	120.35
3	A	502[Y]	COA	N6A-C6A-N1A	-6.46	105.16	118.57
3	A	502[Y]	COA	N3A-C2A-N1A	-5.51	120.07	128.68
6	B	1001[X]	NAD	N3A-C2A-N1A	-5.34	120.33	128.68
2	A	501[X]	ZKE	C5-S1-C3	4.57	108.84	100.16
7	B	1002[Y]	NAI	PN-O3-PA	-4.37	117.85	132.83
6	B	1001[X]	NAD	N6A-C6A-N1A	-4.25	109.75	118.57
6	B	1001[X]	NAD	C3B-C2B-C1B	4.02	107.04	100.98
2	A	501[X]	ZKE	N2-C1-N1	-3.91	122.56	128.68
6	B	1001[X]	NAD	C1B-N9A-C4A	3.82	133.35	126.64
2	A	501[X]	ZKE	C18-N7-C2	-3.50	120.49	126.64
3	A	502[Y]	COA	C6P-C7P-N8P	-3.28	105.27	111.90
6	B	1001[X]	NAD	O4D-C1D-C2D	-3.24	102.20	106.93
7	B	1002[Y]	NAI	O5B-PA-O1A	-3.15	96.75	109.07
7	B	1002[Y]	NAI	O2A-PA-O1A	3.04	127.27	112.24
7	B	1002[Y]	NAI	O1N-PN-O2N	2.94	126.77	112.24
2	A	501[X]	ZKE	C14-C15-N6	-2.90	106.03	111.90
2	A	501[X]	ZKE	P2-O5-P1	-2.75	123.38	132.83
7	B	1002[Y]	NAI	PA-O5B-C5B	-2.67	106.00	121.68

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	A	502[Y]	COA	C2P-C3P-N4P	-2.60	106.37	112.31
7	B	1002[Y]	NAI	C3N-C2N-N1N	-2.53	119.49	123.10
3	A	502[Y]	COA	P2A-O3A-P1A	-2.51	124.20	132.83
7	B	1002[Y]	NAI	O5D-PN-O2N	-2.51	99.25	109.07
2	A	501[X]	ZKE	C25-C24-C18	2.48	105.37	99.89
2	A	501[X]	ZKE	O2-P1-O1	-2.24	101.18	112.24
7	B	1002[Y]	NAI	PN-O5D-C5D	-2.21	108.71	121.68
2	A	501[X]	ZKE	O7-P2-O8	-2.20	101.35	112.24
2	A	501[X]	ZKE	C2-C10-N5	2.18	111.68	109.40
6	B	1001[X]	NAD	C6N-N1N-C2N	-2.18	119.98	121.97
3	A	502[Y]	COA	C3B-C2B-C1B	2.10	104.54	99.89
2	A	501[X]	ZKE	C5-C7-N3	-2.04	108.12	112.42

There are no chirality outliers.

All (31) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	502[Y]	COA	CDP-CBP-CCP-O6A
3	A	502[Y]	COA	CEP-CBP-CCP-O6A
3	A	502[Y]	COA	CAP-CBP-CCP-O6A
3	A	502[Y]	COA	S1P-C2P-C3P-N4P
4	A	503[Z]	A1AFY	O01-C02-C08-C09
6	B	1001[X]	NAD	O4D-C1D-N1N-C2N
6	B	1001[X]	NAD	O4D-C1D-N1N-C6N
6	B	1001[X]	NAD	C2D-C1D-N1N-C6N
7	B	1002[Y]	NAI	C2D-C1D-N1N-C2N
7	B	1002[Y]	NAI	C2N-C3N-C7N-O7N
8	B	1003	MEV	C3-C2-C8-O8
8	B	1003	MEV	C8-C2-C3-C4
8	B	1003	MEV	C8-C2-C3-C6
7	B	1002[Y]	NAI	C2D-C1D-N1N-C6N
2	A	501[X]	ZKE	C25-O18-P3-O13
3	A	502[Y]	COA	C3B-O3B-P3B-O9A
6	B	1001[X]	NAD	PN-O3-PA-O1A
7	B	1002[Y]	NAI	C2N-C3N-C7N-N7N
2	A	501[X]	ZKE	C3-C4-C6-O11
4	A	503[Z]	A1AFY	C04-C02-C08-C09
7	B	1002[Y]	NAI	O4D-C1D-N1N-C2N
2	A	501[X]	ZKE	C23-C20-C21-O10
3	A	502[Y]	COA	P1A-O3A-P2A-O5A
8	B	1003	MEV	C3-C4-C5-O4
2	A	501[X]	ZKE	C25-O18-P3-O12

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Mol	Chain	Res	Type	Atoms
2	A	501[X]	ZKE	C22-C20-C21-O10
8	B	1003	MEV	C3-C4-C5-O3
7	B	1002[Y]	NAI	C3B-C4B-C5B-O5B
2	A	501[X]	ZKE	C25-O18-P3-O14
6	B	1001[X]	NAD	C2D-C1D-N1N-C2N
7	B	1002[Y]	NAI	O4D-C1D-N1N-C6N

There are no ring outliers.

2 monomers are involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
6	B	1001[X]	NAD	1	0
3	A	502[Y]	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 then 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.

Ligand MEV B 1003

Bond lengths

Bond angles

Torsions

Rings

Ligand A1AFY A 503 (Z)

Bond lengths

Bond angles

Torsions

Rings

Ligand SO4 A 504

Bond lengths

Bond angles

Torsions

Rings

Ligand NAD B 1001 (X)

Bond lengths

Bond angles

Torsions

Rings

Ligand COA A 502 (Y)

Bond lengths

Bond angles

Torsions

Rings

Ligand ZKE A 501 (X)

Bond lengths

Bond angles

Torsions

Rings

Ligand NAI B 1002 (Y)

Bond lengths

Bond angles

Torsions

Rings

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	421/428 (98%)	0.13	23 (5%)	25	26	13, 31, 68, 110	3 (0%)
1	B	375/428 (87%)	-0.02	12 (3%)	47	50	14, 30, 60, 75	3 (0%)
All	All	796/856 (92%)	0.06	35 (4%)	34	35	13, 30, 64, 110	6 (0%)

All (35) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	422	LEU	4.8
1	A	410	TYR	4.8
1	A	396	ARG	4.7
1	A	237	ALA	3.3
1	B	877	ILE	3.3
1	B	738	GLU	3.2
1	A	407	LEU	3.2
1	B	526	LEU	3.1
1	A	166	ASP	3.1
1	A	406	GLN	3.0
1	A	390	ALA	3.0
1	A	405	ARG	3.0
1	A	398	ASP	2.9
1	B	513	LEU	2.9
1	A	402	TRP	2.9
1	A	121	ILE	2.7
1	A	393	ALA	2.7
1	A	403	VAL	2.6
1	B	739	PHE	2.6
1	B	525	LEU	2.6
1	A	420	ALA	2.6
1	A	329	GLY	2.6
1	A	208	GLN	2.5
1	A	419	VAL	2.5

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Mol	Chain	Res	Type	RSRZ
1	A	144	ARG	2.5
1	B	520	ASP	2.5
1	A	421	LEU	2.4
1	B	573	ARG	2.4
1	A	232	GLN	2.4
1	A	386	ALA	2.3
1	B	530	HIS	2.3
1	B	531	ASP	2.2
1	B	517	ALA	2.2
1	B	708[A]	GLN	2.2
1	A	395	ALA	2.2

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 monosaccharides 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
3	COA	A	502[Y]	48/48	0.86	0.17	31,48,59,60	48
8	MEV	B	1003	10/10	0.86	0.17	35,40,47,51	0
2	ZKE	A	501[X]	58/58	0.88	0.15	26,47,60,62	58
6	NAD	B	1001[X]	44/44	0.92	0.13	43,50,55,56	44
7	NAI	B	1002[Y]	44/44	0.92	0.13	20,26,30,31	44
5	SO4	A	504	5/5	0.92	0.12	60,60,74,77	0
4	A1AFY	A	503[Z]	10/10	0.94	0.13	19,23,25,27	10

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 A 502 (Y):

$2mF_o\text{-}DF_c$ (at 0.7 rmsd) in gray
$mF_o\text{-}DF_c$ (at 3 rmsd) in purple (negative)
and green (positive)
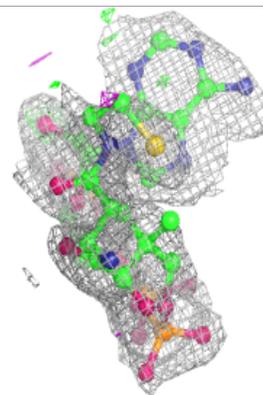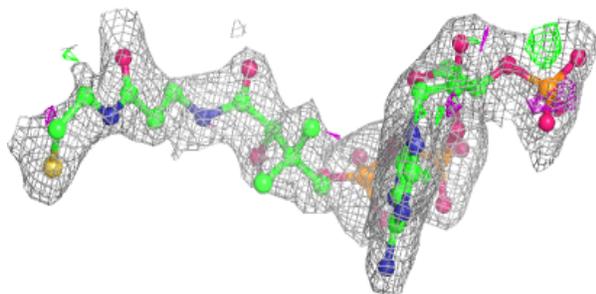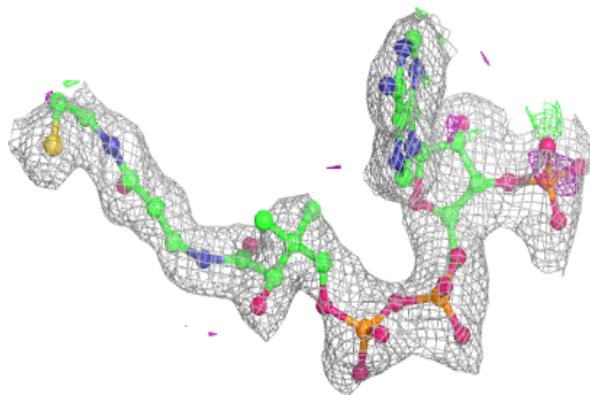
Electron density around MEV B 1003:

$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)
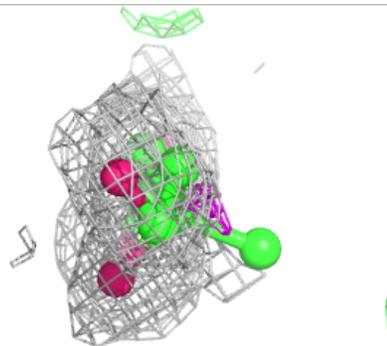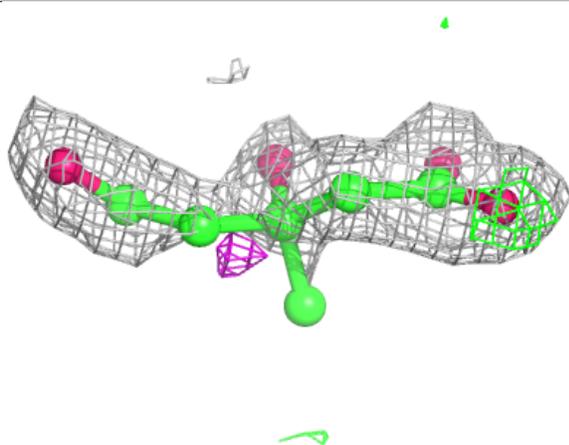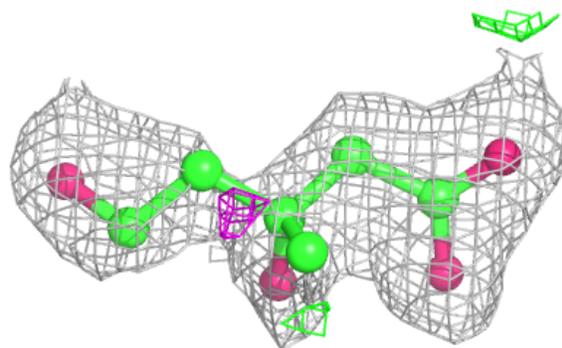
Electron density around ZKE A 501 (X):

$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)
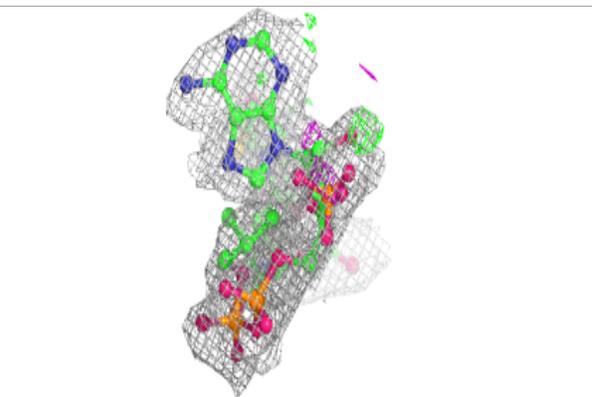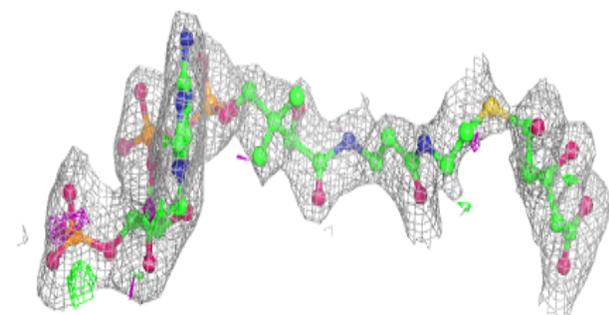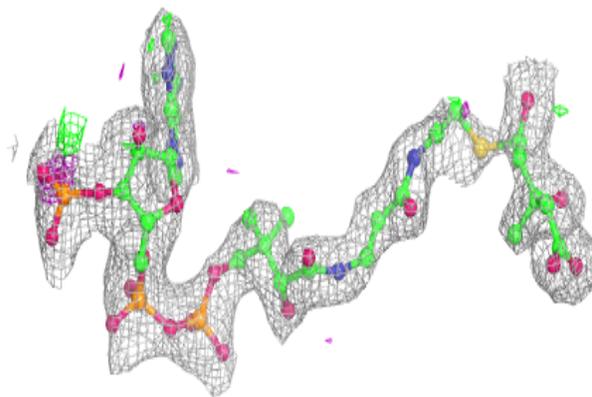
Electron density around NAD B 1001 (X):

$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)
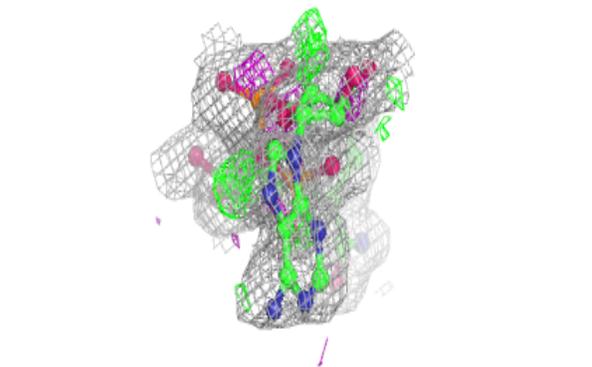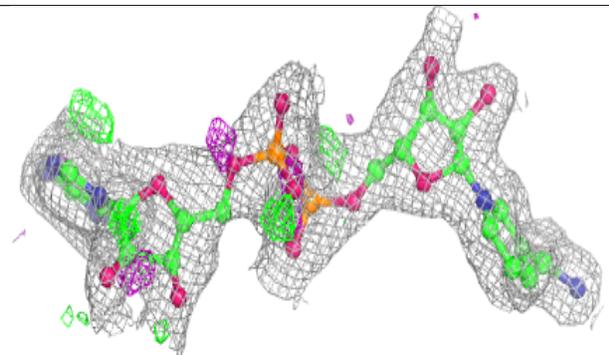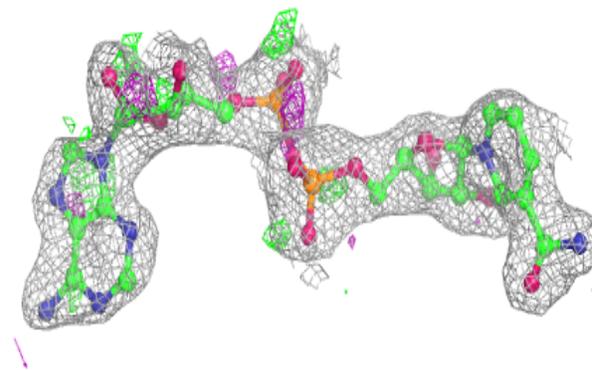
Electron density around NAI B 1002 (Y):

$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)
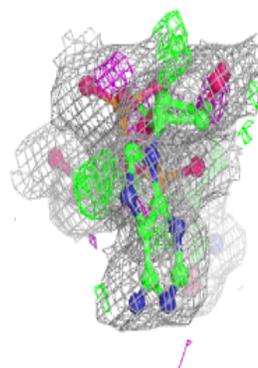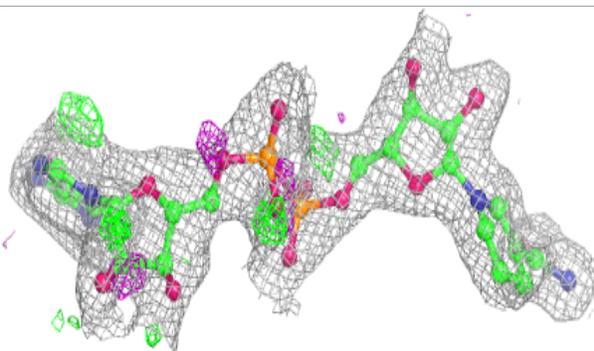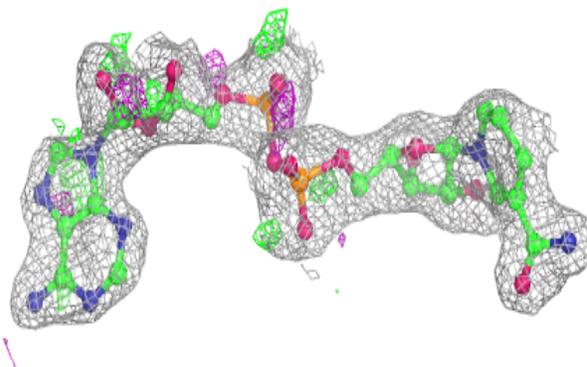
Electron density around SO4 A 504:

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

Electron density around A1AFY A 503 (Z):

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

6.5 Other polymers ⓘ

There are no such residues in this entry.