wwPDB X-ray Structure Validation Summary Report (i)

Jun 12, 2024 – 08:31 PM EDT

PDB ID	:	1EFL
Title	:	HUMAN MALIC ENZYME IN A QUATERNARY COMPLEX WITH NAD, MG, AND TARTRONATE
Authors	:	Yang, Z.; Floyd, D.L.; Loeber, G.; Tong, L.
Deposited on	:	2000-02-09
Resolution	:	2.60 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 (i) 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 (1)) were used in the production of this report:

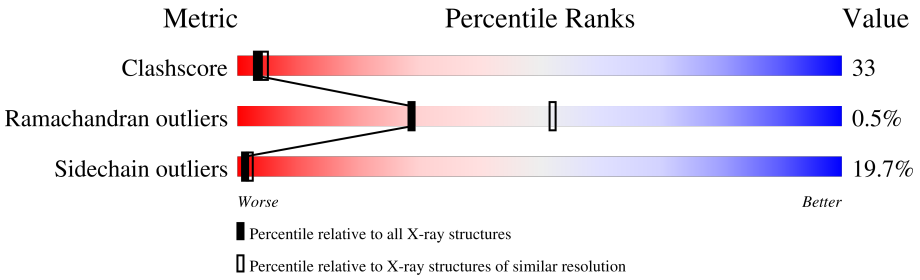
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	NOT EXECUTED
EDS	:	NOT EXECUTED
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.36.2

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 2.60 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
Clashscore	141614	3518 (2.60-2.60)
Ramachandran outliers	138981	3455 (2.60-2.60)
Sidechain outliers	138945	3455 (2.60-2.60)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for >=3, 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions <=5%

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	584	45% 38% 12% 5%
1	B	584	39% 44% 11% 5%
1	C	584	45% 40% 10% 5%
1	D	584	43% 42% 9% 5%

2 Entry composition (i)

There are 5 unique types of molecules in this entry. The entry contains 17947 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 MALIC ENZYME.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	553	Total	C	N	O	S	Se	0	0	0
			4367	2796	744	804	9	14			
1	B	553	Total	C	N	O	S	Se	0	0	0
			4367	2796	744	804	9	14			
1	C	553	Total	C	N	O	S	Se	0	0	0
			4367	2796	744	804	9	14			
1	D	553	Total	C	N	O	S	Se	0	0	0
			4367	2796	744	804	9	14			

There are 56 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	29	MSE	MET	MODIFIED RESIDUE	UNP P23368
A	38	MSE	MET	MODIFIED RESIDUE	UNP P23368
A	47	MSE	MET	MODIFIED RESIDUE	UNP P23368
A	75	MSE	MET	MODIFIED RESIDUE	UNP P23368
A	86	MSE	MET	MODIFIED RESIDUE	UNP P23368
A	108	MSE	MET	MODIFIED RESIDUE	UNP P23368
A	177	MSE	MET	MODIFIED RESIDUE	UNP P23368
A	219	MSE	MET	MODIFIED RESIDUE	UNP P23368
A	239	MSE	MET	MODIFIED RESIDUE	UNP P23368
A	325	MSE	MET	MODIFIED RESIDUE	UNP P23368
A	327	MSE	MET	MODIFIED RESIDUE	UNP P23368
A	343	MSE	MET	MODIFIED RESIDUE	UNP P23368
A	407	MSE	MET	MODIFIED RESIDUE	UNP P23368
A	539	MSE	MET	MODIFIED RESIDUE	UNP P23368
B	29	MSE	MET	MODIFIED RESIDUE	UNP P23368
B	38	MSE	MET	MODIFIED RESIDUE	UNP P23368
B	47	MSE	MET	MODIFIED RESIDUE	UNP P23368
B	75	MSE	MET	MODIFIED RESIDUE	UNP P23368
B	86	MSE	MET	MODIFIED RESIDUE	UNP P23368
B	108	MSE	MET	MODIFIED RESIDUE	UNP P23368
B	177	MSE	MET	MODIFIED RESIDUE	UNP P23368

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Chain	Residue	Modelled	Actual	Comment	Reference
B	219	MSE	MET	MODIFIED RESIDUE	UNP P23368
B	239	MSE	MET	MODIFIED RESIDUE	UNP P23368
B	325	MSE	MET	MODIFIED RESIDUE	UNP P23368
B	327	MSE	MET	MODIFIED RESIDUE	UNP P23368
B	343	MSE	MET	MODIFIED RESIDUE	UNP P23368
B	407	MSE	MET	MODIFIED RESIDUE	UNP P23368
B	539	MSE	MET	MODIFIED RESIDUE	UNP P23368
C	29	MSE	MET	MODIFIED RESIDUE	UNP P23368
C	38	MSE	MET	MODIFIED RESIDUE	UNP P23368
C	47	MSE	MET	MODIFIED RESIDUE	UNP P23368
C	75	MSE	MET	MODIFIED RESIDUE	UNP P23368
C	86	MSE	MET	MODIFIED RESIDUE	UNP P23368
C	108	MSE	MET	MODIFIED RESIDUE	UNP P23368
C	177	MSE	MET	MODIFIED RESIDUE	UNP P23368
C	219	MSE	MET	MODIFIED RESIDUE	UNP P23368
C	239	MSE	MET	MODIFIED RESIDUE	UNP P23368
C	325	MSE	MET	MODIFIED RESIDUE	UNP P23368
C	327	MSE	MET	MODIFIED RESIDUE	UNP P23368
C	343	MSE	MET	MODIFIED RESIDUE	UNP P23368
C	407	MSE	MET	MODIFIED RESIDUE	UNP P23368
C	539	MSE	MET	MODIFIED RESIDUE	UNP P23368
D	29	MSE	MET	MODIFIED RESIDUE	UNP P23368
D	38	MSE	MET	MODIFIED RESIDUE	UNP P23368
D	47	MSE	MET	MODIFIED RESIDUE	UNP P23368
D	75	MSE	MET	MODIFIED RESIDUE	UNP P23368
D	86	MSE	MET	MODIFIED RESIDUE	UNP P23368
D	108	MSE	MET	MODIFIED RESIDUE	UNP P23368
D	177	MSE	MET	MODIFIED RESIDUE	UNP P23368
D	219	MSE	MET	MODIFIED RESIDUE	UNP P23368
D	239	MSE	MET	MODIFIED RESIDUE	UNP P23368
D	325	MSE	MET	MODIFIED RESIDUE	UNP P23368
D	327	MSE	MET	MODIFIED RESIDUE	UNP P23368
D	343	MSE	MET	MODIFIED RESIDUE	UNP P23368
D	407	MSE	MET	MODIFIED RESIDUE	UNP P23368
D	539	MSE	MET	MODIFIED RESIDUE	UNP P23368

- Molecule 2 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

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

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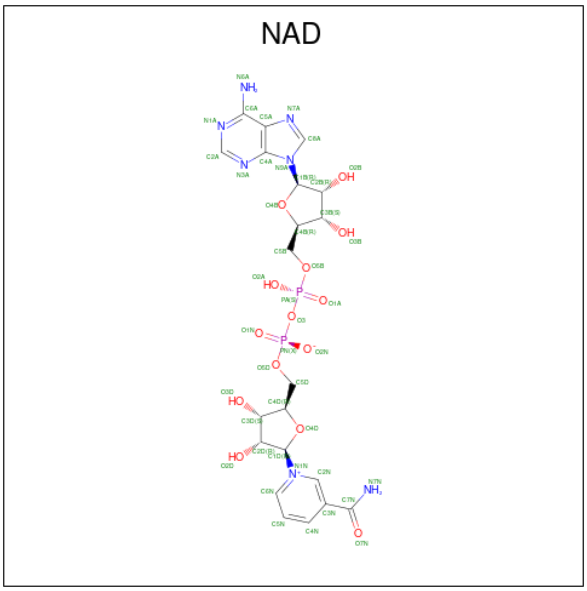
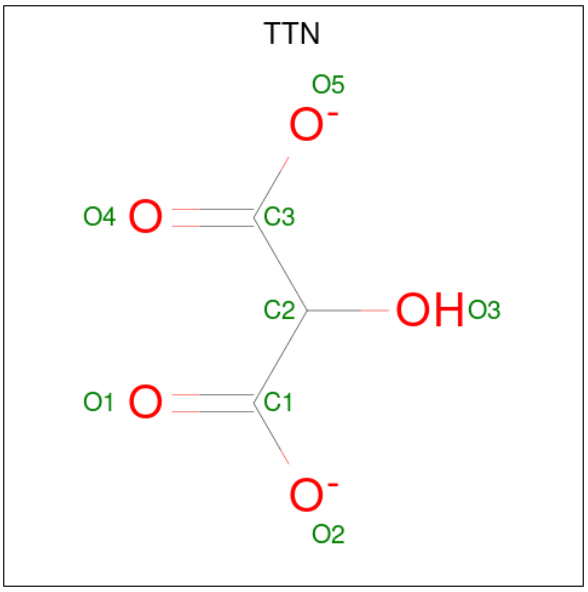
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	C	1	Total Mg 1 1	0	0
2	D	1	Total Mg 1 1	0	0

- Molecule 3 is NICOTINAMIDE-ADENINE-DINUCLEOTIDE (three-letter code: NAD) (formula: $C_{21}H_{27}N_7O_{14}P_2$).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	1	Total C N O P 44 21 7 14 2	0	0
3	A	1	Total C N O P 44 21 7 14 2	9	0
3	B	1	Total C N O P 44 21 7 14 2	0	0
3	B	1	Total C N O P 44 21 7 14 2	9	0
3	C	1	Total C N O P 44 21 7 14 2	0	0
3	C	1	Total C N O P 44 21 7 14 2	9	0
3	D	1	Total C N O P 44 21 7 14 2	0	0
3	D	1	Total C N O P 44 21 7 14 2	9	0

- Molecule 4 is TARTRONATE (three-letter code: TTN) (formula: $C_3H_2O_5$).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	1	Total C O 8 3 5	0	0
4	B	1	Total C O 8 3 5	0	0
4	C	1	Total C O 8 3 5	0	0
4	D	1	Total C O 8 3 5	0	0

- Molecule 5 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	A	24	Total O 24 24	0	0
5	B	17	Total O 17 17	0	0
5	C	23	Total O 23 23	0	0
5	D	27	Total O 27 27	0	0

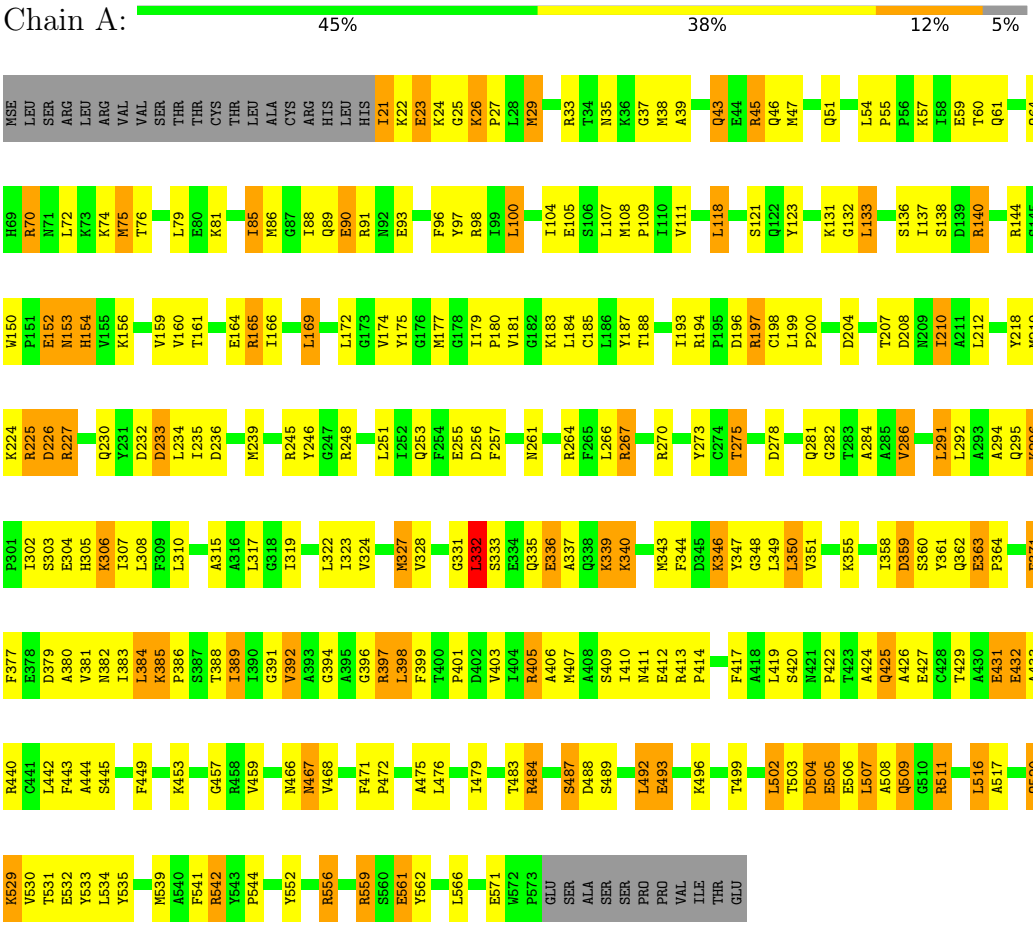
3 Residue-property plots (i)

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry. 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. 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.

Note EDS was not executed.

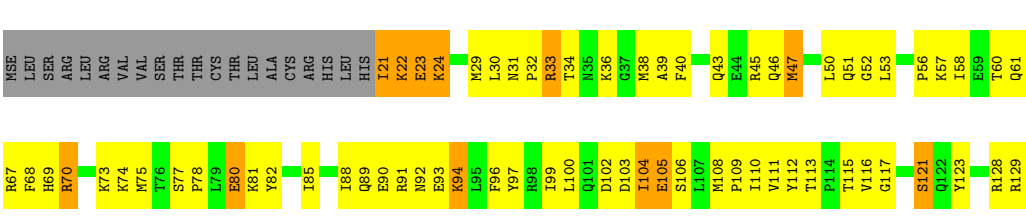
• Molecule 1: MALIC ENZYME

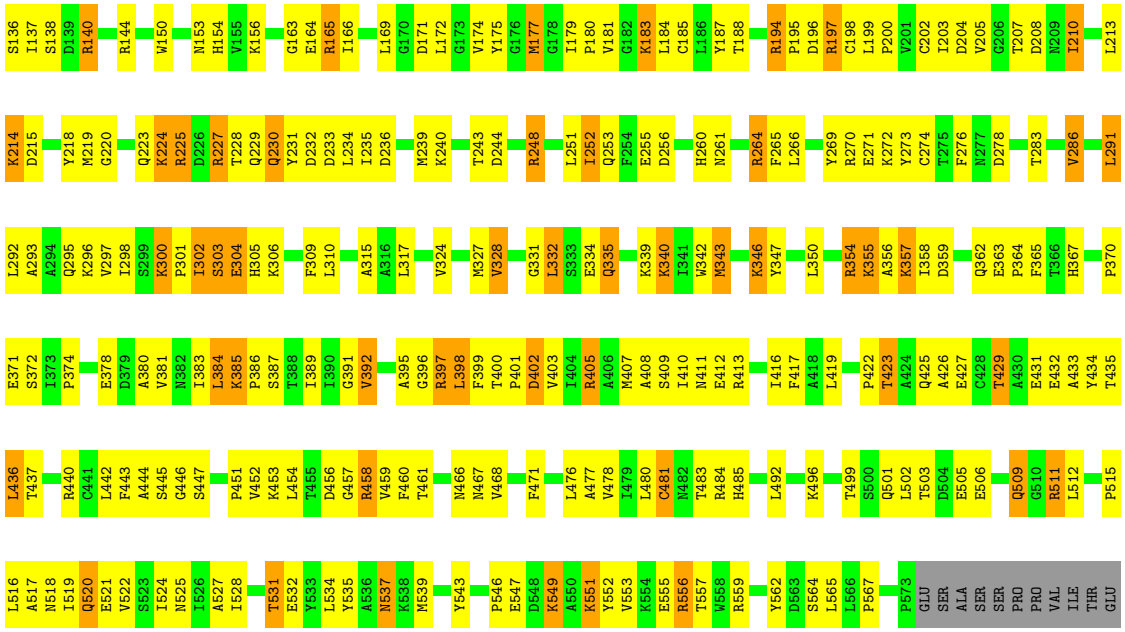
Chain A:



• Molecule 1: MALIC ENZYME

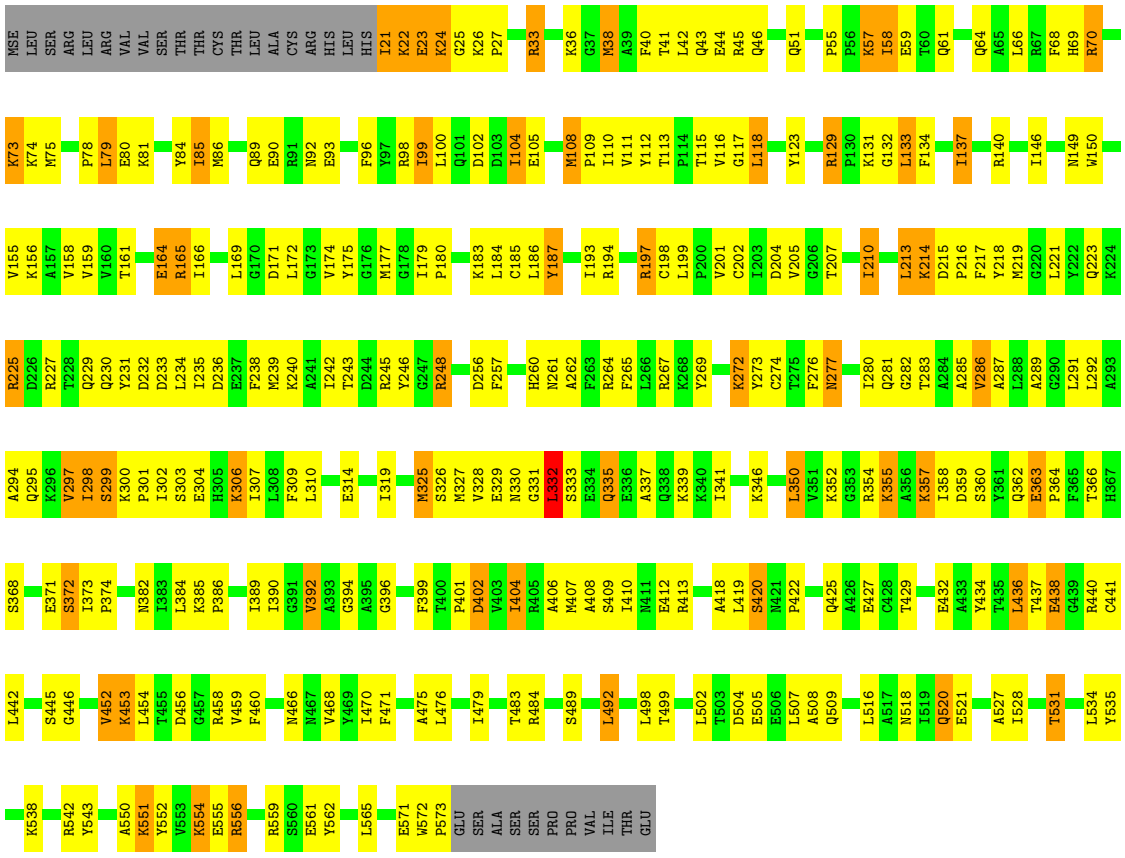
Chain B:





• Molecule 1: MALIC ENZYME

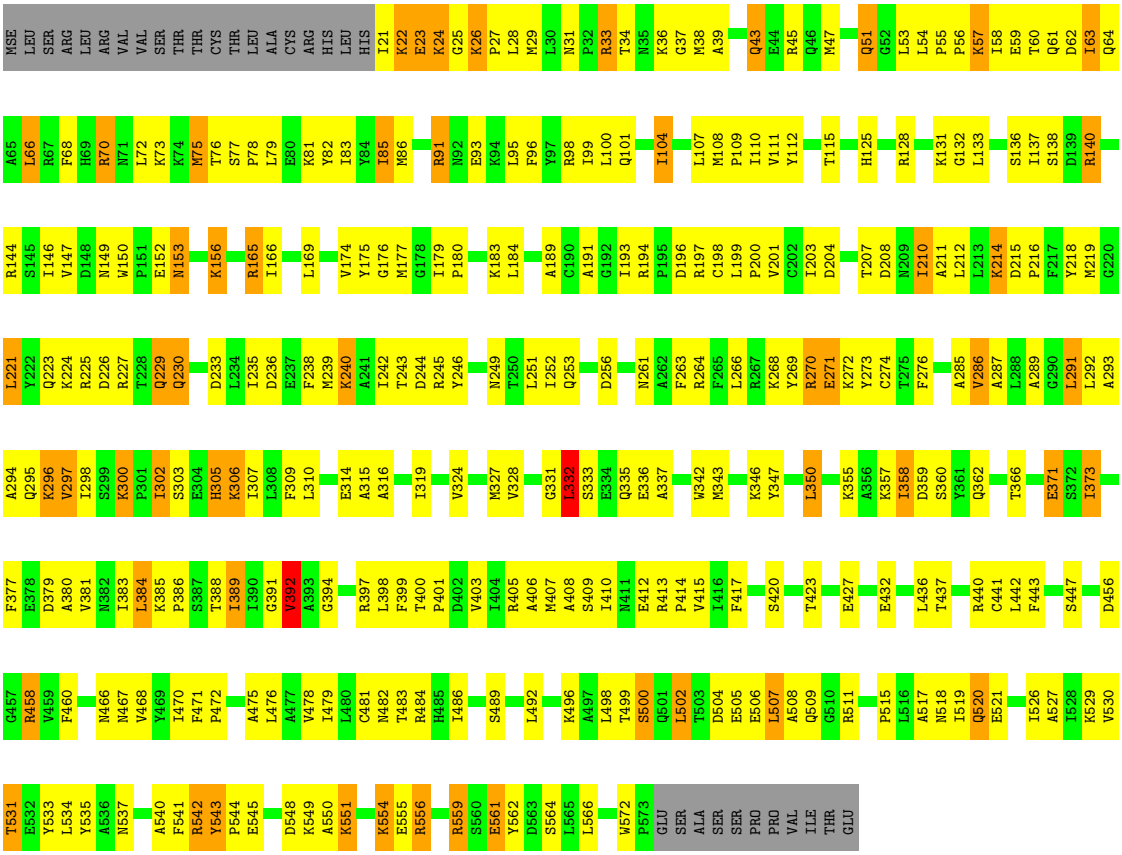
Chain C:



• Molecule 1: MALIC ENZYME

Chain D:


43%
42%
9%
5%


MSE LEU SER ARG LEU ARG VAL VAL SER THR THR CYS THR LEU ALA CYS ARG HIS LEU HIS I21 K22 E23 K24 G25 K26 P27 L28 M29 L30 N31 P32 R33 T34 N35 K36 G37 M38 A39 Q43 E44 R45 Q46 M47 Q51 G52 L53 L54 P55 P56 K57 I58 E59 T60 Q61 D62 I63 Q64
A65 L66 R67 F68 H69 R70 N71 L72 K73 K74 M75 T76 S77 P78 L79 E80 K81 Y82 I83 Y84 I85 M86 R91 N92 E93 K94 L95 F96 Y97 R98 I99 L100 Q101 I104 L107 M108 P109 I110 V111 Y112 T115 H125 R128 K131 G132 L133 S136 I137 S138 D139 R140
R144 S145 I146 V147 D148 N149 W150 P151 E152 N153 K156 R165 I166 L169 V174 Y175 G176 M177 G178 I179 P180 K183 L184 A189 C190 A191 G192 I193 R194 P195 D196 R197 C198 L199 P200 V201 C202 I203 D204 T207 D208 N209 I210 A211 L212 L213 K214 D215 P216 F217 Y218 M219 G220
L221 Y222 Q223 K224 R225 D226 R227 T228 Q229 Q230 D233 L234 I235 D236 E237 F238 M239 K240 A241 I242 T243 D244 R245 Y246 N249 T250 L251 I252 Q253 D256 N261 A262 F263 R264 F265 L266 R267 K268 Y269 R270 E271 K272 Y273 C274 T275 F276 A285 V286 A287 L288 A289 G290 L291 L292 A293
A294 Q295 K296 V297 I298 S299 K300 P301 I302 S303 E304 H305 K306 I307 L308 F309 L310 E314 A315 A316 I319 V324 M327 V328 G331 L332 S333 E334 Q335 E336 A337 W342 M343 K346 Y347 L350 K355 A356 K357 I358 D359 S360 Y361 Q362 T366 E371 S372 I373
F377 E378 D379 A380 V381 N382 I383 L384 K385 P386 S387 T388 I389 I390 G391 V392 A393 G394 R397 L398 F399 T400 P401 D402 V403 I404 R405 A406 M407 A408 S409 I410 N411 E412 R413 P414 V415 I416 F417 S420 T423 E427 E432 L436 T437 R440 C441 L442 F443 S447 D456
G457 R458 V459 F460 N466 N467 V468 Y469 I470 F471 P472 A475 L476 A477 V478 I479 L480 C481 N482 T483 R484 H485 I486 S489 L492 K496 A497 L498 T499 S500 Q501 L502 T503 D504 E505 E506 L507 A508 Q509 G510 R511 P515 L516 A517 N518 I519 Q520 E521 I526 A527 I528 K529 V530
T531 E532 Y533 L534 Y535 A536 N537 A540 F541 R542 Y543 P544 E545 D548 K549 A550 K551 K554 E555 R556 R559 S560 E561 Y562 D563 S564 L565 L566 W572 P573 GLU SER ALA SER SER PRO PRO PRO VAL ILE THR GLU

4 Data and refinement statistics (i)

Xtriage (Phenix) and EDS were not executed - this section is therefore incomplete.

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α, β, γ	228.80Å 117.00Å 114.30Å 90.00° 109.20° 90.00°	Depositor
Resolution (Å)	20.00 – 2.60	Depositor
% Data completeness (in resolution range)	(Not available) (20.00-2.60)	Depositor
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	X-PLOR 3.851	Depositor
R, R_{free}	0.206 , 0.285	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	17947	wwPDB-VP
Average B, all atoms (Å^2)	21.0	wwPDB-VP

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: NAD, TTN, MG

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	0.46	0/4447	0.65	0/5998
1	B	0.46	0/4447	0.66	0/5998
1	C	0.45	0/4447	0.65	1/5998 (0.0%)
1	D	0.46	0/4447	0.65	0/5998
All	All	0.46	0/17788	0.65	1/23992 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	C	310	LEU	N-CA-C	-5.09	97.27	111.00

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	4367	0	4407	333	0
1	B	4367	0	4407	331	0
1	C	4367	0	4407	252	0
1	D	4367	0	4407	314	0
2	A	1	0	0	0	0
2	B	1	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	C	1	0	0	0	0
2	D	1	0	0	0	0
3	A	88	0	52	6	0
3	B	88	0	52	2	0
3	C	88	0	52	5	0
3	D	88	0	52	4	0
4	A	8	0	1	0	0
4	B	8	0	1	1	0
4	C	8	0	1	2	0
4	D	8	0	2	1	0
5	A	24	0	0	5	0
5	B	17	0	0	9	0
5	C	23	0	0	5	0
5	D	27	0	0	3	0
All	All	17947	0	17841	1185	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 33.

The worst 5 of 1185 close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:227:ARG:HH11	1:A:227:ARG:HG2	1.03	1.11
1:D:520:GLN:HE22	1:D:521:GLU:HG2	1.13	1.07
1:A:511:ARG:HH11	1:A:511:ARG:HB3	1.20	1.02
1:C:355:LYS:HA	1:C:355:LYS:HE2	1.42	1.01
1:B:227:ARG:HG2	1:B:227:ARG:HH11	1.24	1.00

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	551/584 (94%)	516 (94%)	33 (6%)	2 (0%)	34	57
1	B	551/584 (94%)	513 (93%)	35 (6%)	3 (0%)	29	52
1	C	551/584 (94%)	525 (95%)	23 (4%)	3 (0%)	29	52
1	D	551/584 (94%)	515 (94%)	32 (6%)	4 (1%)	22	43
All	All	2204/2336 (94%)	2069 (94%)	123 (6%)	12 (0%)	29	52

5 of 12 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	332	LEU
1	C	332	LEU
1	C	392	VAL
1	A	332	LEU
1	D	270	ARG

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	469/483 (97%)	371 (79%)	98 (21%)	1	2
1	B	469/483 (97%)	373 (80%)	96 (20%)	1	2
1	C	469/483 (97%)	379 (81%)	90 (19%)	1	2
1	D	469/483 (97%)	384 (82%)	85 (18%)	1	2
All	All	1876/1932 (97%)	1507 (80%)	369 (20%)	1	2

5 of 369 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	232	ASP
1	D	24	LYS
1	C	277	ASN
1	C	404	ILE
1	D	91	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 52 such sidechains are listed below:

Mol	Chain	Res	Type
1	C	229	GLN
1	C	425	GLN
1	D	485	HIS
1	C	230	GLN
1	C	321	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)

Of 16 ligands modelled in this entry, 4 are monoatomic - leaving 12 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	$\#\|Z\| > 2$
3	NAD	D	3601	-	42,48,48	2.10	12 (28%)	50,73,73	1.32	4 (8%)
3	NAD	D	3602	-	42,48,48	2.23	11 (26%)	50,73,73	1.44	6 (12%)
4	TTN	D	3603	2	5,7,7	1.34	0	2,9,9	2.01	1 (50%)
3	NAD	C	2601	-	42,48,48	2.08	12 (28%)	50,73,73	1.34	3 (6%)
3	NAD	A	601	-	42,48,48	2.01	11 (26%)	50,73,73	1.37	5 (10%)
3	NAD	B	1601	-	42,48,48	2.11	12 (28%)	50,73,73	1.35	5 (10%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\|>2$	Counts	RMSZ	$\#\|Z\|>2$
4	TTN	B	1603	2	5,7,7	1.35	1 (20%)	2,9,9	1.96	1 (50%)
4	TTN	A	603	2	5,7,7	1.34	1 (20%)	2,9,9	2.07	1 (50%)
4	TTN	C	2603	2	5,7,7	1.37	2 (40%)	2,9,9	2.16	1 (50%)
3	NAD	B	1602	-	42,48,48	2.15	12 (28%)	50,73,73	1.35	6 (12%)
3	NAD	C	2602	-	42,48,48	2.29	14 (33%)	50,73,73	1.39	6 (12%)
3	NAD	A	602	-	42,48,48	2.19	11 (26%)	50,73,73	1.46	6 (12%)

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
3	NAD	D	3601	-	-	2/26/62/62	0/5/5/5
3	NAD	D	3602	-	-	12/26/62/62	0/5/5/5
4	TTN	D	3603	2	-	4/8/8/8	-
3	NAD	C	2601	-	-	2/26/62/62	0/5/5/5
3	NAD	A	601	-	-	2/26/62/62	0/5/5/5
3	NAD	B	1601	-	-	3/26/62/62	0/5/5/5
4	TTN	B	1603	2	-	2/8/8/8	-
4	TTN	A	603	2	-	2/8/8/8	-
4	TTN	C	2603	2	-	2/8/8/8	-
3	NAD	B	1602	-	-	11/26/62/62	0/5/5/5
3	NAD	C	2602	-	-	9/26/62/62	0/5/5/5
3	NAD	A	602	-	-	11/26/62/62	0/5/5/5

The worst 5 of 99 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	D	3602	NAD	C2N-N1N	7.58	1.44	1.35
3	C	2602	NAD	C2N-N1N	7.51	1.44	1.35
3	B	1602	NAD	C2N-N1N	7.40	1.44	1.35
3	A	602	NAD	C2N-N1N	7.35	1.43	1.35
3	C	2602	NAD	O4D-C1D	6.80	1.50	1.41

The worst 5 of 45 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	C	2601	NAD	N3A-C2A-N1A	-5.35	120.32	128.68
3	A	602	NAD	N3A-C2A-N1A	-5.19	120.57	128.68
3	A	601	NAD	N3A-C2A-N1A	-5.15	120.64	128.68
3	B	1601	NAD	N3A-C2A-N1A	-5.07	120.75	128.68
3	D	3601	NAD	N3A-C2A-N1A	-5.06	120.78	128.68

There are no chirality outliers.

5 of 62 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	601	NAD	O4D-C1D-N1N-C6N
3	A	602	NAD	C5B-O5B-PA-O1A
3	A	602	NAD	PA-O3-PN-O5D
3	A	602	NAD	C5D-O5D-PN-O3
3	A	602	NAD	C5D-O5D-PN-O2N

There are no ring outliers.

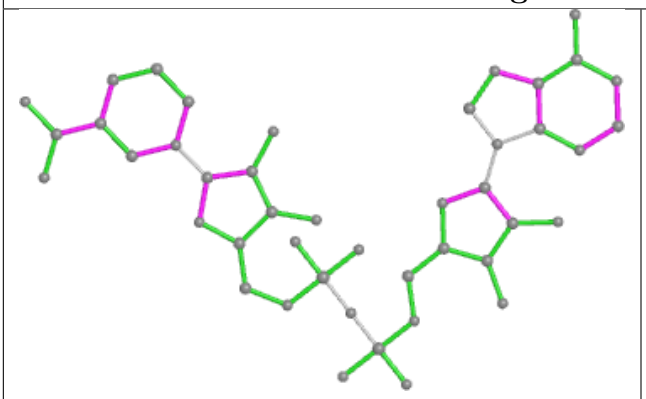
11 monomers are involved in 21 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	D	3601	NAD	1	0
3	D	3602	NAD	3	0
4	D	3603	TTN	1	0
3	C	2601	NAD	4	0
3	A	601	NAD	4	0
3	B	1601	NAD	1	0
4	B	1603	TTN	1	0
4	C	2603	TTN	2	0
3	B	1602	NAD	1	0
3	C	2602	NAD	1	0
3	A	602	NAD	2	0

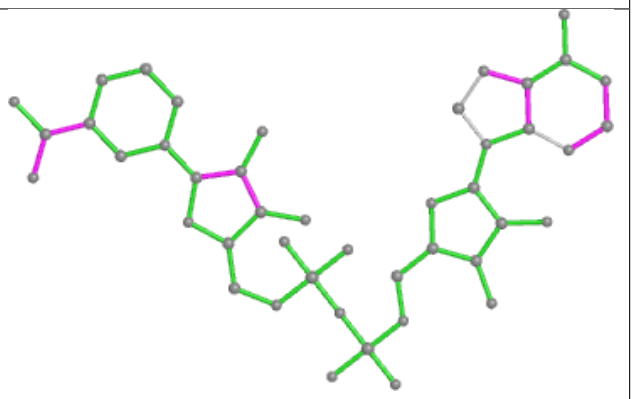
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. 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.

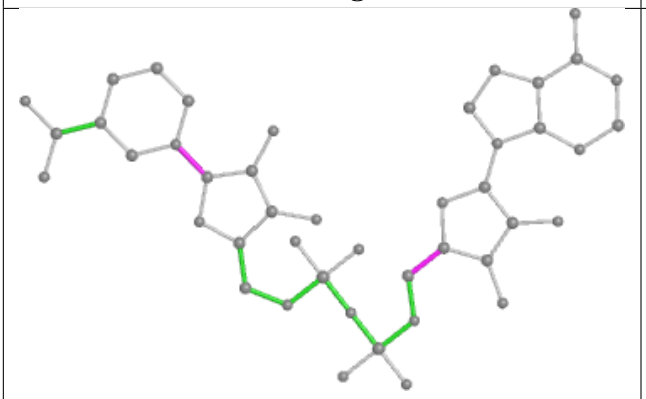
Ligand NAD D 3601



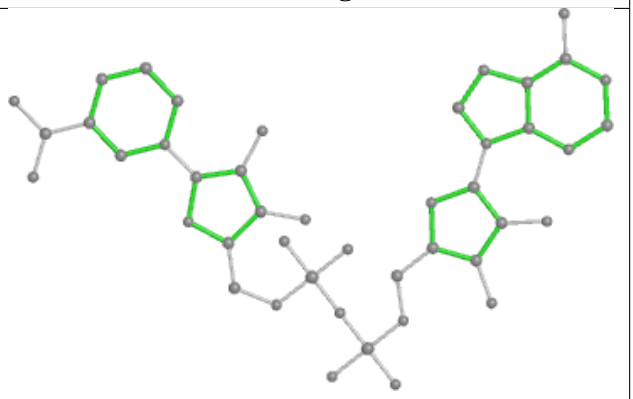
Bond lengths



Bond angles

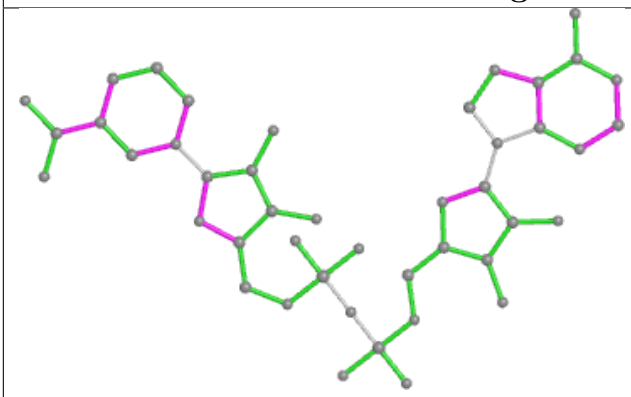


Torsions

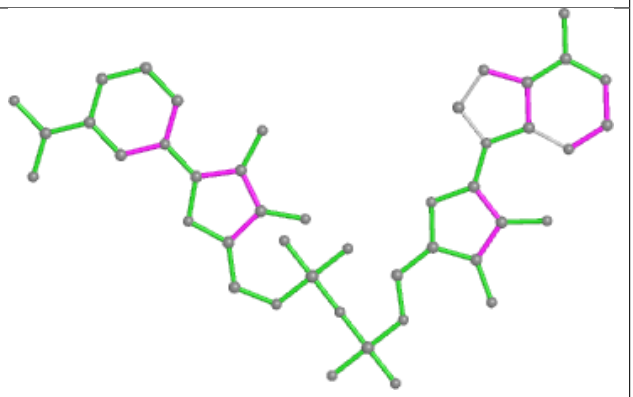


Rings

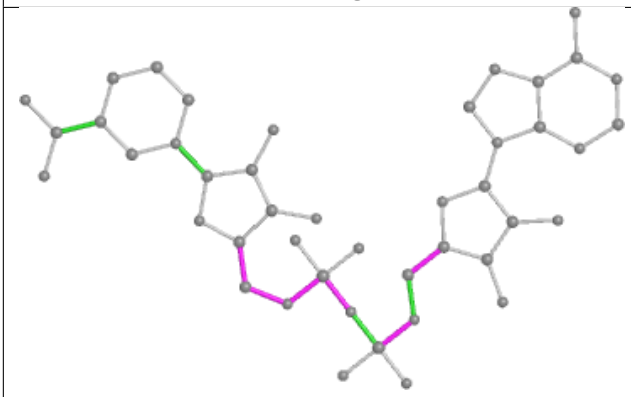
Ligand NAD D 3602



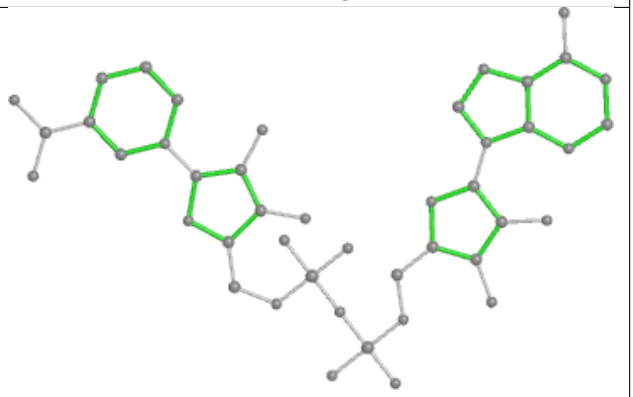
Bond lengths



Bond angles

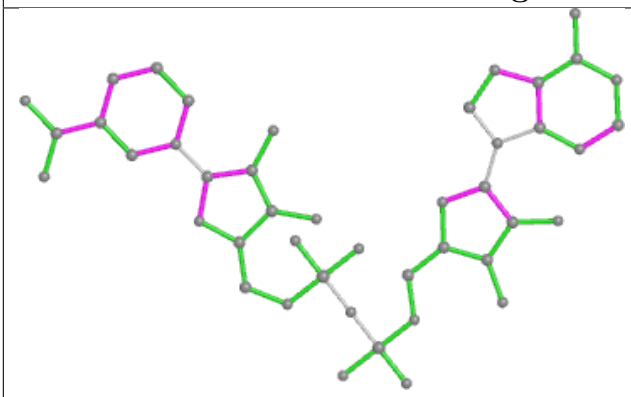


Torsions

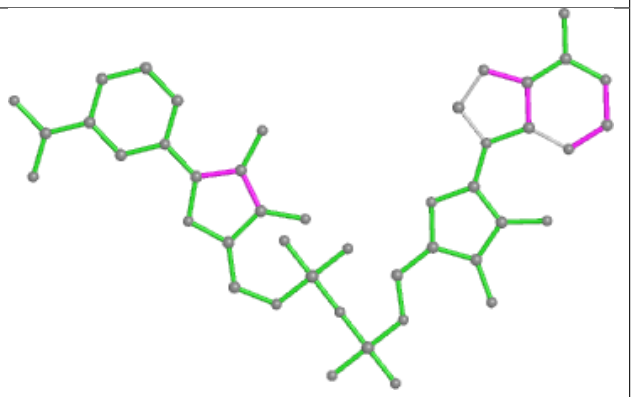


Rings

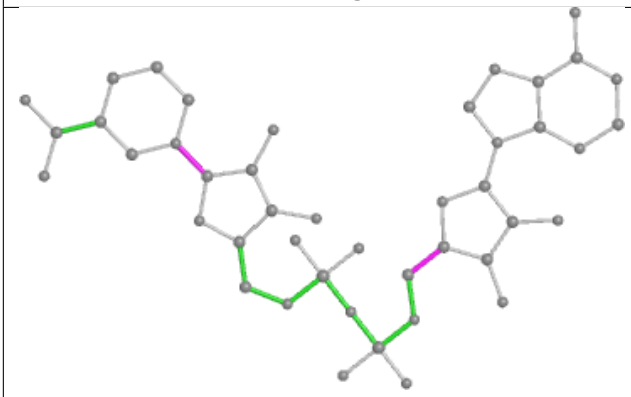
Ligand NAD C 2601



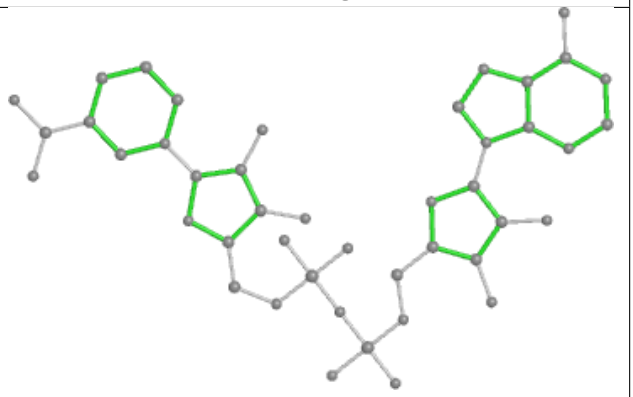
Bond lengths



Bond angles

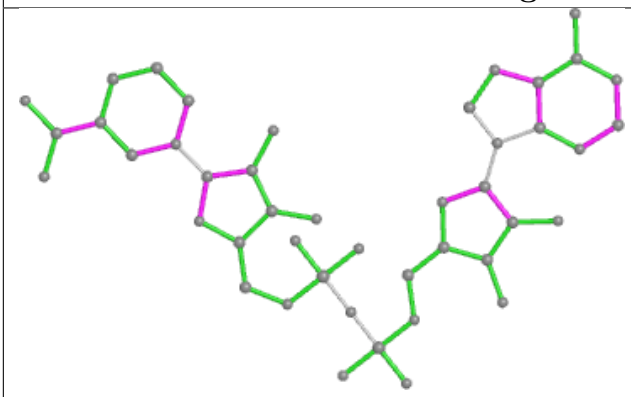


Torsions

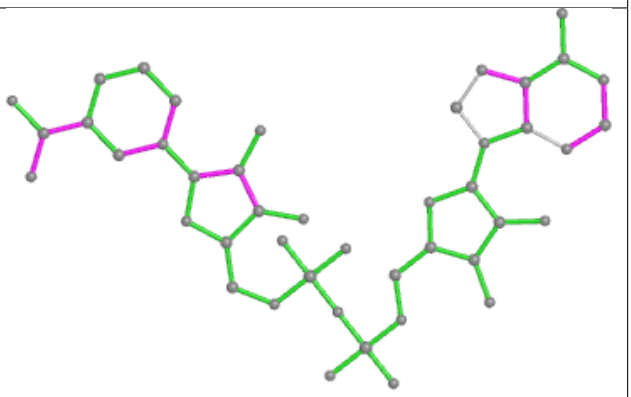


Rings

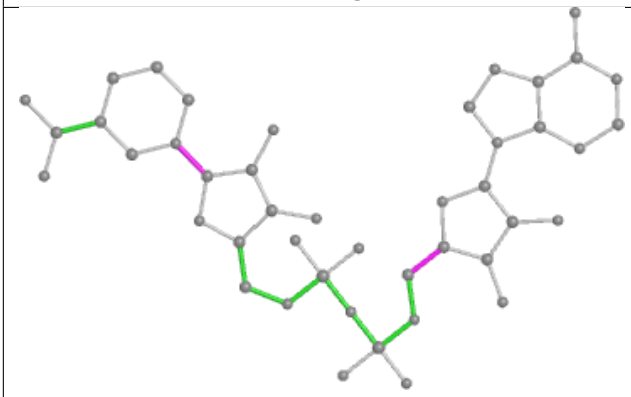
Ligand NAD A 601



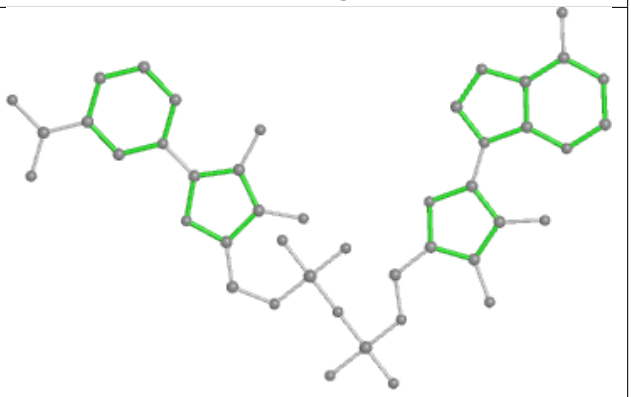
Bond lengths



Bond angles

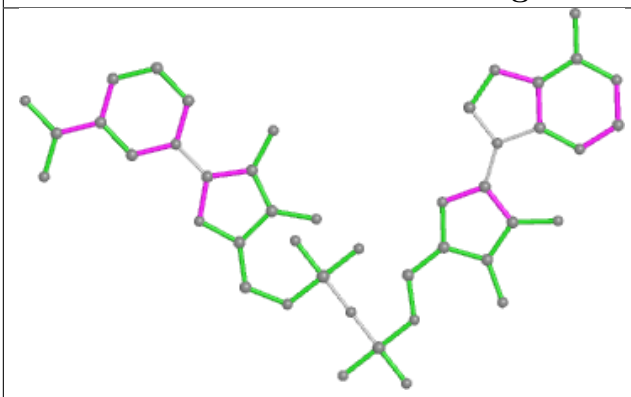


Torsions

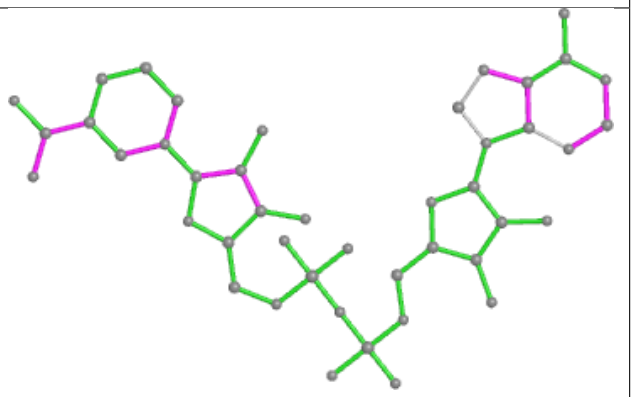


Rings

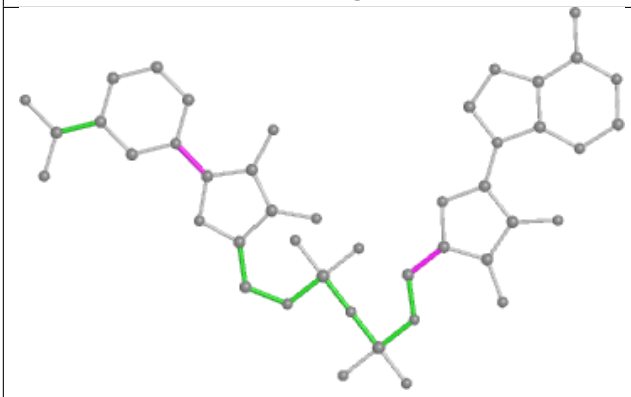
Ligand NAD B 1601



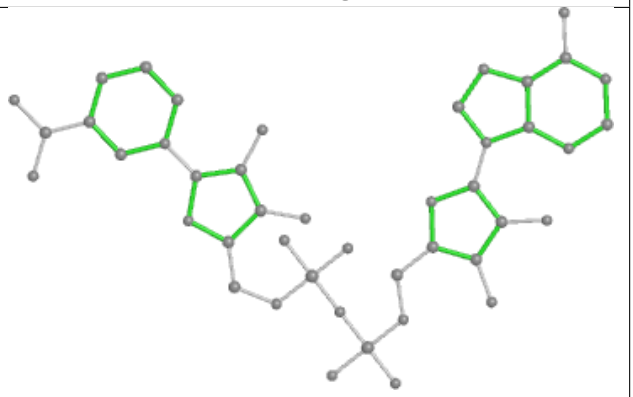
Bond lengths



Bond angles

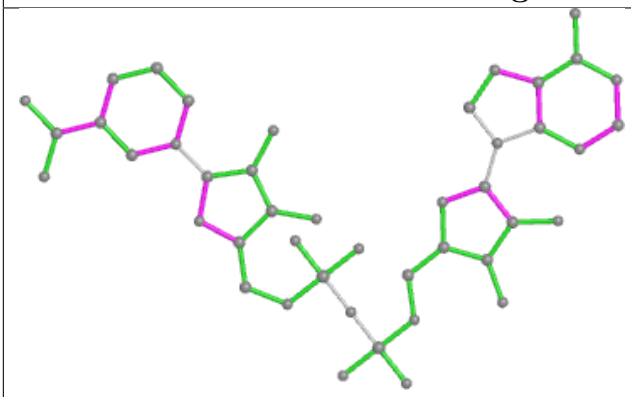


Torsions

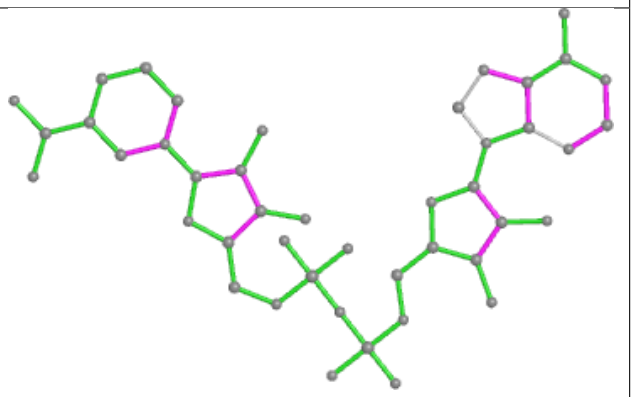


Rings

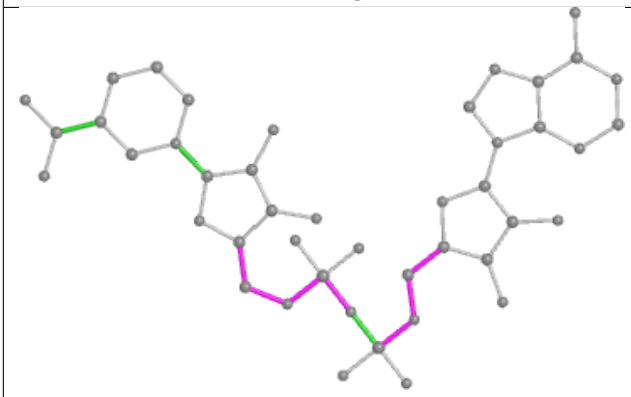
Ligand NAD B 1602



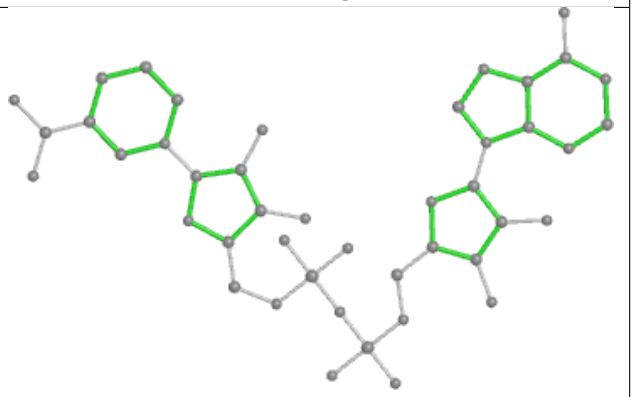
Bond lengths



Bond angles

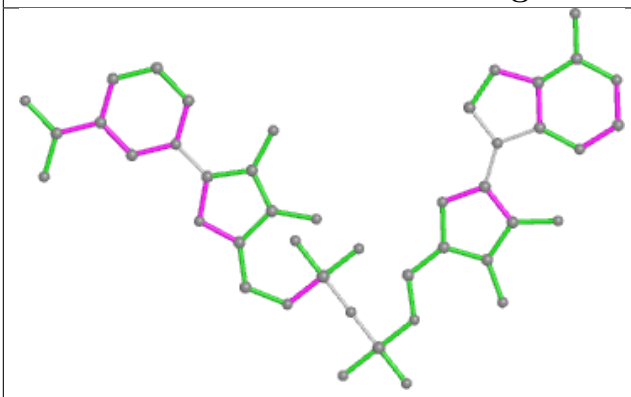


Torsions

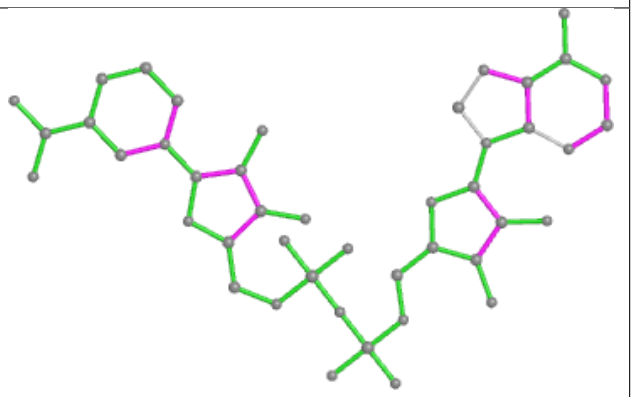


Rings

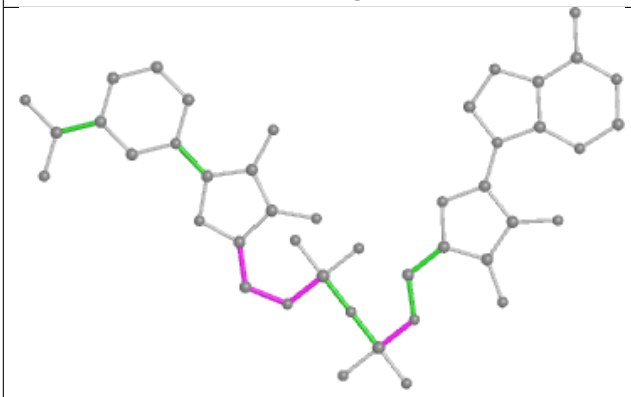
Ligand NAD C 2602



Bond lengths



Bond angles



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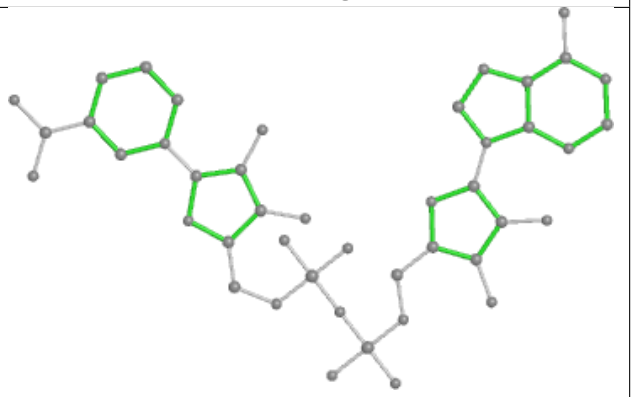
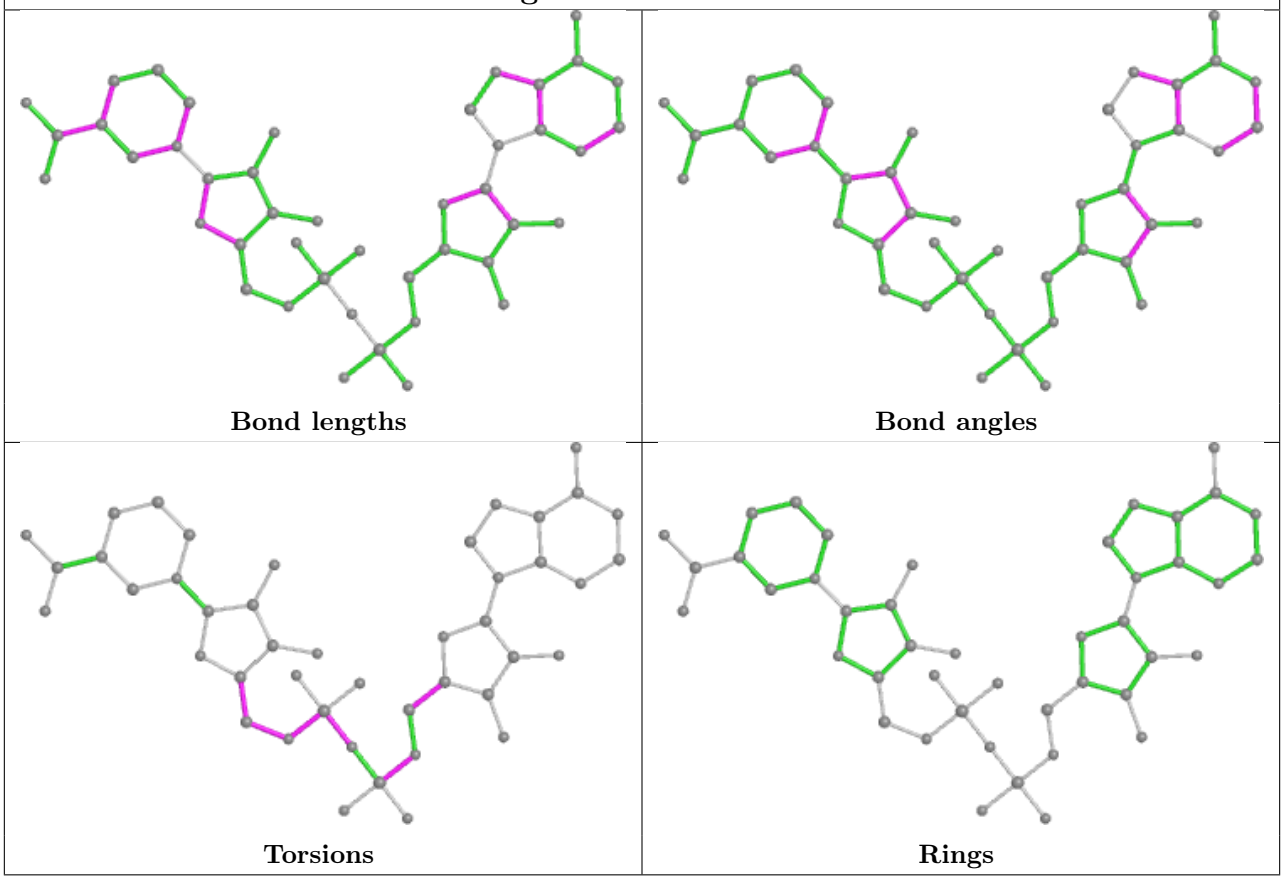


Rings

Ligand NAD A 602



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

EDS was not executed - this section is therefore empty.

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

EDS was not executed - this section is therefore empty.

6.3 Carbohydrates

EDS was not executed - this section is therefore empty.

6.4 Ligands

EDS was not executed - this section is therefore empty.

6.5 Other polymers

EDS was not executed - this section is therefore empty.