# wwPDB X-ray Structure Validation Summary Report (i)

Jun 14, 2020 – 04:32 am BST

| | | |
|---|---|---|
| PDB ID | : | 1KY4 |
| Title | : | S-Adenosylhomocysteine hydrolase refined with noncrystallographic restraints |
| Authors | : | Takata, Y.; Takusagawa, F. |
| Deposited on | : | 2002-02-03 |
| Resolution | : | 2.80 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 following versions of software and data (see references (1)) were used in the production of this report:

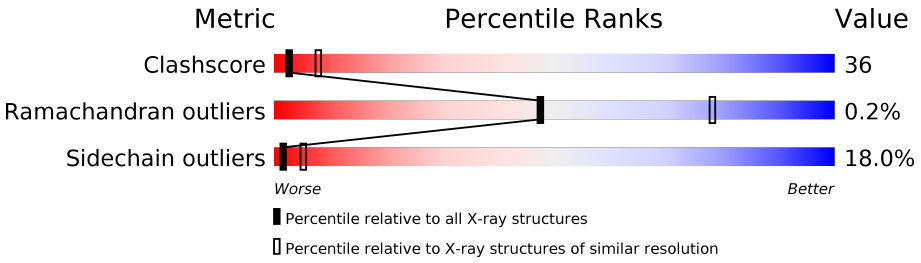
| | | |
|---|---|---|
| MolProbity | : | 4.02b-467 |
| Mogul | : | 1.8.5 (274361), CSD as541be (2020) |
| Xtriage (Phenix) | : | NOT EXECUTED |
| EDS | : | NOT EXECUTED |
| buster-report | : | 1.1.7 (2018) |
| Percentile statistics | : | 20191225.v01 (using entries in the PDB archive December 25th 2019) |
| Ideal geometry (proteins) | : | Engh & Huber (2001) |
| Ideal geometry (DNA, RNA) | : | Parkinson et al. (1996) |
| Validation Pipeline (wwPDB-VP) | : | 2.11 |

# 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 2.80 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 | 3569 (2.80-2.80) |
| Ramachandran outliers | 138981 | 3498 (2.80-2.80) |
| Sidechain outliers | 138945 | 3500 (2.80-2.80) |

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

Note EDS was not executed.

| Mol | Chain | Length | Quality of chain |
|---|---|---|---|
| 1 | A | 431 | 48% 42% 10% |
| 1 | B | 431 | 46% 44% 9% |
| 1 | C | 431 | 47% 42% 10% |
| 1 | D | 431 | 45% 44% 10% |

## 2 Entry composition

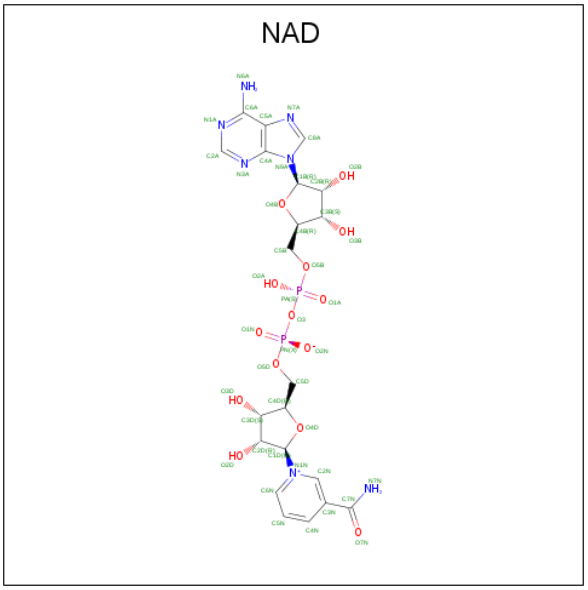
There are 3 unique types of molecules in this entry. The entry contains 13650 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 S-adenosylhomocysteine hydrolase.

| Mol | Chain | Residues | Atoms | | | | | ZeroOcc | AltConf | Trace |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | A | 428 | Total | C | N | O | S | 0 | 0 | 0 |
| | | | 3302 | 2098 | 568 | 611 | 25 | | | |
| 1 | B | 428 | Total | C | N | O | S | 0 | 0 | 0 |
| | | | 3302 | 2098 | 568 | 611 | 25 | | | |
| 1 | C | 428 | Total | C | N | O | S | 0 | 0 | 0 |
| | | | 3302 | 2098 | 568 | 611 | 25 | | | |
| 1 | D | 428 | Total | C | N | O | S | 0 | 0 | 0 |
| | | | 3302 | 2098 | 568 | 611 | 25 | | | |

- Molecule 2 is NICOTINAMIDE-ADENINE-DINUCLEOTIDE (three-letter code: NAD) (formula: $C_{21}H_{27}N_7O_{14}P_2$).




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

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| Mol | Chain | Residues | Atoms | | | | | ZeroOcc | AltConf |
|---|---|---|---|---|---|---|---|---|---|
| 2 | C | 1 | Total | C | N | O | P | 0 | 0 |
| | | | 44 | 21 | 7 | 14 | 2 | | |
| 2 | D | 1 | Total | C | N | O | P | 0 | 0 |
| | | | 44 | 21 | 7 | 14 | 2 | | |

- Molecule 3 is water.

| Mol | Chain | Residues | Atoms | | ZeroOcc | AltConf |
|---|---|---|---|---|---|---|
| 3 | A | 68 | Total | O | 0 | 0 |
| | | | 68 | 68 | | |
| 3 | B | 75 | Total | O | 0 | 0 |
| | | | 75 | 75 | | |
| 3 | C | 60 | Total | O | 0 | 0 |
| | | | 60 | 60 | | |
| 3 | D | 63 | Total | O | 0 | 0 |
| | | | 63 | 63 | | |

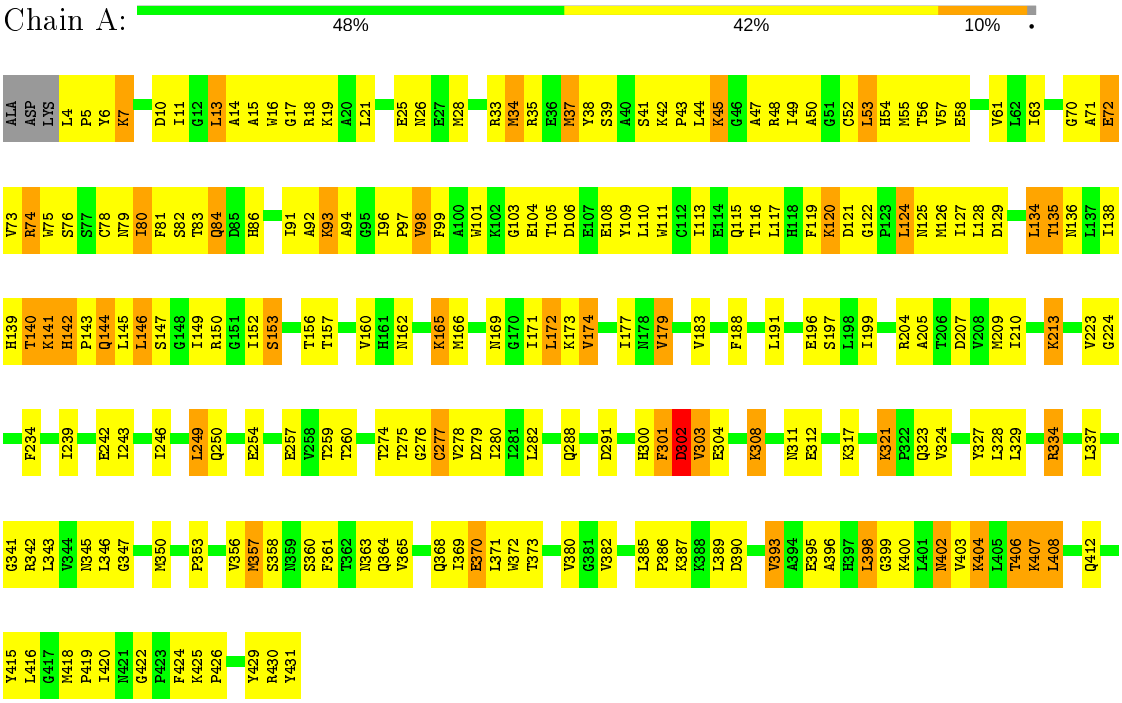
# 3 Residue-property plots (i)

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

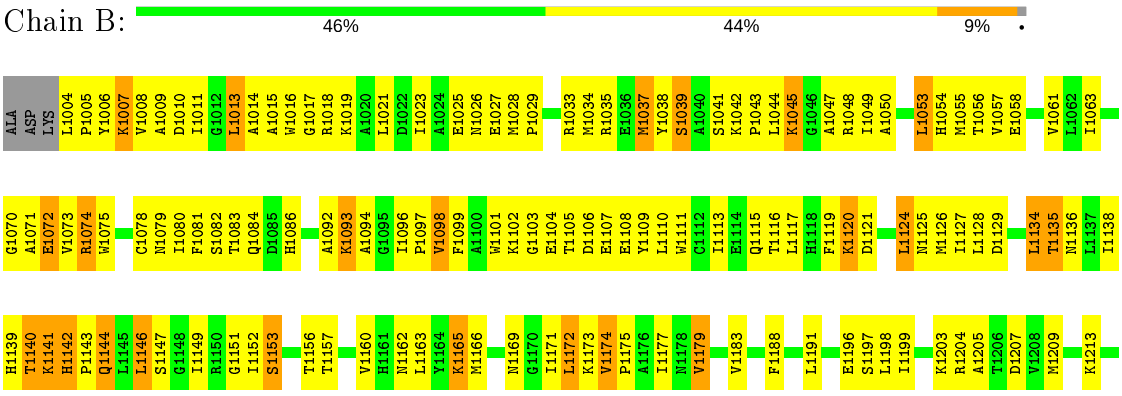
- Molecule 1: S-adenosylhomocysteine hydrolase

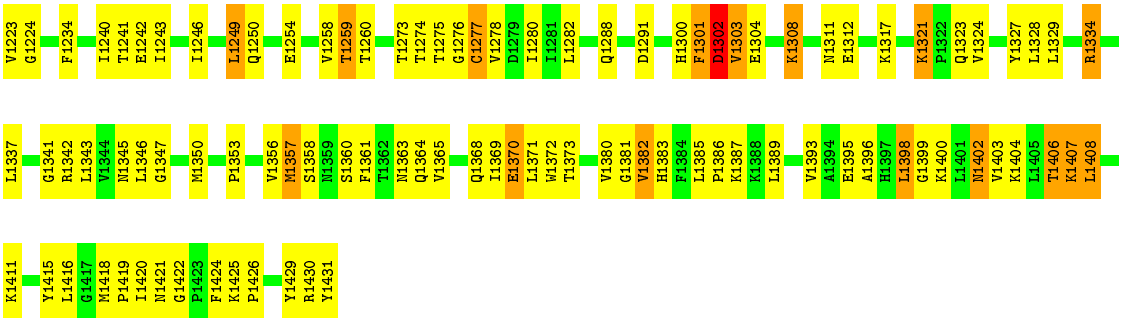
Chain A:




- Molecule 1: S-adenosylhomocysteine hydrolase

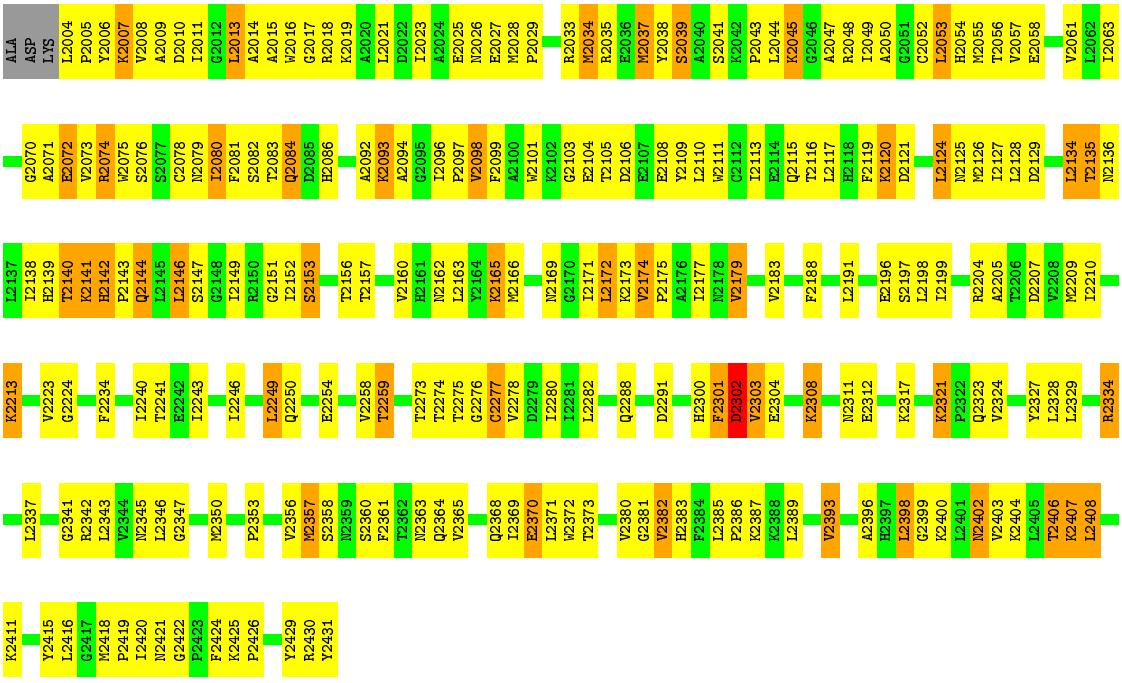
Chain B:





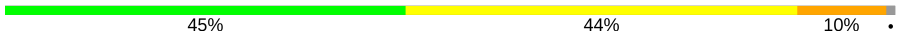
• Molecule 1: S-adenosylhomocysteine hydrolase

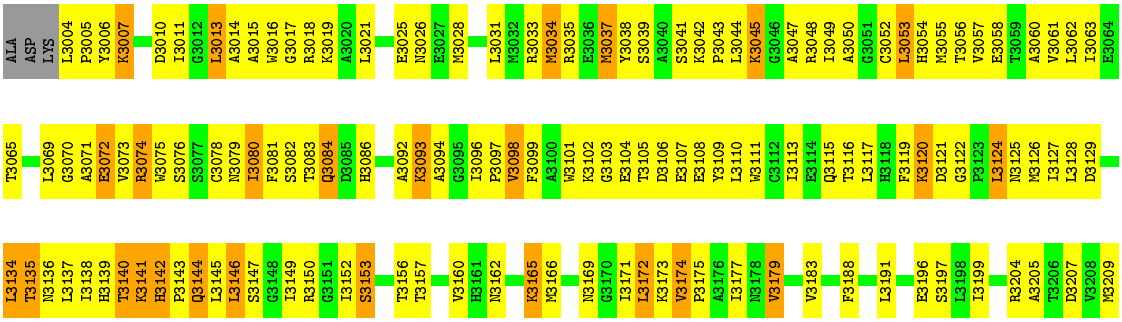
Chain C:

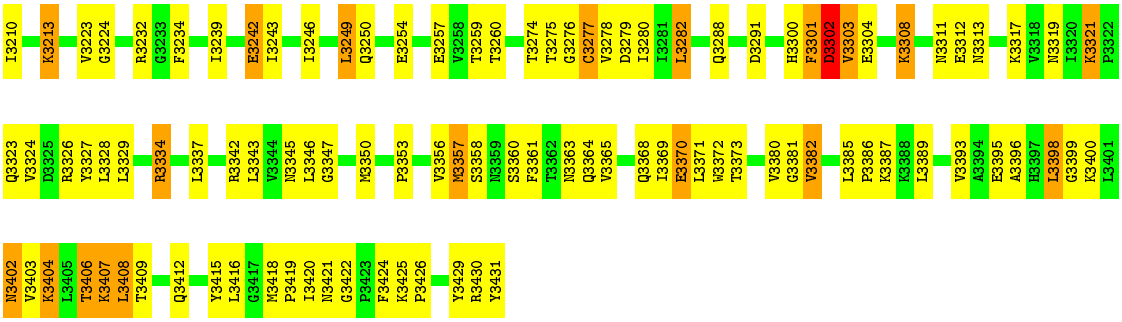



• Molecule 1: S-adenosylhomocysteine hydrolase

Chain D:




I3210
K3213
V3223
G3224
R3232
G3233
F3234
I3239
E3242
I3243
I3246
L3249
Q3250
E3254
E3257
V3258
T3259
T3260
T3274
T3275
G3276
Q3277
V3278
D3279
I3280
I3281
L3282
Q3288
D3291
H3300
F3301
D3302
V3303
E3304
K3308
N3311
E3312
N3313
K3317
V3318
N3319
I3320
K3321
P3322
Q3323
V3324
D3325
R3326
Y3327
L3328
L3329
R3334
L3337
R3342
L3343
V3344
N3345
L3346
G3347
M3350
P3353
V3356
M3357
S3358
N3359
S3360
F3361
T3362
N3363
Q3364
V3365
Q3368
I3369
E3370
L3371
W3372
T3373
V3380
G3381
V3382
L3385
P3386
K3387
K3388
L3389
V3393
A3394
E3395
A3396
H3397
L3398
G3399
K3400
L3401
N3402
V3403
K3404
L3405
T3406
K3407
L3408
T3409
Q3412
Y3415
L3416
G3417
M3418
P3419
I3420
N3421
G3422
P3423
F3424
K3425
P3426
Y3429
R3430
Y3431

# 4 Data and refinement statistics (i)

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

| Property | Value | Source |
|---|---|---|
| Space group | P 1 21 1 | Depositor |
| Cell constants<br>a, b, c, $\alpha$, $\beta$, $\gamma$ | 94.76Å 134.48Å 102.26Å<br>90.00° 114.35° 90.00° | Depositor |
| Resolution (Å) | 8.00 – 2.80 | Depositor |
| % Data completeness<br>(in resolution range) | (Not available) (8.00-2.80) | Depositor |
| $R_{merge}$ | 0.07 | Depositor |
| $R_{sym}$ | 0.07 | Depositor |
| Refinement program | X-PLOR 3.851 | Depositor |
| R, $R_{free}$ | 0.228 , 0.278 | Depositor |
| Estimated twinning fraction | No twinning to report. | Xtriage |
| Total number of atoms | 13650 | wwPDB-VP |
| Average B, all atoms (Å$^2$) | 12.0 | 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

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 | 0.37 | 0/3367 | 0.63 | 1/4557 (0.0%) |
| 1 | B | 0.37 | 0/3367 | 0.62 | 1/4557 (0.0%) |
| 1 | C | 0.37 | 0/3367 | 0.62 | 1/4557 (0.0%) |
| 1 | D | 0.37 | 0/3367 | 0.62 | 1/4557 (0.0%) |
| All | All | 0.37 | 0/13468 | 0.62 | 4/18228 (0.0%) |

There are no bond length outliers.

All (4) bond angle outliers are listed below:

| Mol | Chain | Res | Type | Atoms | Z | Observed($^o$) | Ideal($^o$) |
|---|---|---|---|---|---|---|---|
| 1 | D | 3302 | ASP | N-CA-C | 5.47 | 125.76 | 111.00 |
| 1 | A | 302 | ASP | N-CA-C | 5.31 | 125.33 | 111.00 |
| 1 | C | 2302 | ASP | N-CA-C | 5.06 | 124.67 | 111.00 |
| 1 | B | 1302 | ASP | N-CA-C | 5.01 | 124.53 | 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 | 3302 | 0 | 3324 | 253 | 0 |
| 1 | B | 3302 | 0 | 3324 | 268 | 0 |
| 1 | C | 3302 | 0 | 3324 | 259 | 0 |

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| Mol | Chain | Non-H | H(model) | H(added) | Clashes | Symm-Clashes |
|---|---|---|---|---|---|---|
| 1 | D | 3302 | 0 | 3324 | 266 | 0 |
| 2 | A | 44 | 0 | 26 | 1 | 0 |
| 2 | B | 44 | 0 | 26 | 0 | 0 |
| 2 | C | 44 | 0 | 26 | 1 | 0 |
| 2 | D | 44 | 0 | 26 | 0 | 0 |
| 3 | A | 68 | 0 | 0 | 2 | 0 |
| 3 | B | 75 | 0 | 0 | 8 | 0 |
| 3 | C | 60 | 0 | 0 | 2 | 0 |
| 3 | D | 63 | 0 | 0 | 10 | 0 |
| All | All | 13650 | 0 | 13400 | 968 | 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 36.

The worst 5 of 968 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:C:2430:ARG:HB3 | 1:D:3430:ARG:HB3 | 1.25 | 1.15 |
| 1:A:430:ARG:HB3 | 1:B:1430:ARG:HB3 | 1.29 | 1.15 |
| 1:A:370:GLU:HG3 | 1:A:389:LEU:HD11 | 1.41 | 1.03 |
| 1:D:3370:GLU:HG3 | 1:D:3389:LEU:HD11 | 1.41 | 1.03 |
| 1:C:2370:GLU:HG3 | 1:C:2389:LEU:HD11 | 1.39 | 1.01 |

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 | 426/431 (99%) | 409 (96%) | 16 (4%) | 1 (0%) | 47 78 |
| 1 | B | 426/431 (99%) | 407 (96%) | 18 (4%) | 1 (0%) | 47 78 |

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| Mol | Chain | Analysed | Favoured | Allowed | Outliers | Percentiles |
|---|---|---|---|---|---|---|
| 1 | C | 426/431 (99%) | 410 (96%) | 15 (4%) | 1 (0%) | 47 78 |
| 1 | D | 426/431 (99%) | 408 (96%) | 17 (4%) | 1 (0%) | 47 78 |
| All | All | 1704/1724 (99%) | 1634 (96%) | 66 (4%) | 4 (0%) | 47 78 |

All (4) Ramachandran outliers are listed below:

| Mol | Chain | Res | Type |
|---|---|---|---|
| 1 | A | 302 | ASP |
| 1 | B | 1302 | ASP |
| 1 | C | 2302 | ASP |
| 1 | D | 3302 | ASP |

### 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 | 351/353 (99%) | 288 (82%) | 63 (18%) | 2 5 |
| 1 | B | 351/353 (99%) | 288 (82%) | 63 (18%) | 2 5 |
| 1 | C | 351/353 (99%) | 287 (82%) | 64 (18%) | 1 5 |
| 1 | D | 351/353 (99%) | 288 (82%) | 63 (18%) | 2 5 |
| All | All | 1404/1412 (99%) | 1151 (82%) | 253 (18%) | 1 5 |

5 of 253 residues with a non-rotameric sidechain are listed below:

| Mol | Chain | Res | Type |
|---|---|---|---|
| 1 | B | 1370 | GLU |
| 1 | C | 2098 | VAL |
| 1 | D | 3301 | PHE |
| 1 | B | 1393 | VAL |
| 1 | C | 2026 | ASN |

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 31 such sidechains are listed below:

| Mol | Chain | Res | Type |
|---|---|---|---|
| 1 | B | 1169 | ASN |
| 1 | C | 2084 | GLN |
| 1 | D | 3169 | ASN |
| 1 | B | 1300 | HIS |
| 1 | C | 2115 | GLN |

#### 5.3.3 RNA

There are no RNA molecules in this entry.

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

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

### 5.5 Carbohydrates

There are no carbohydrates in this entry.

### 5.6 Ligand geometry

4 ligands are modelled in this entry.

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

| Mol | Type | Chain | Res | Link | Bond lengths | | | Bond angles | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Counts | RMSZ | $\#\|Z\| > 2$ | Counts | RMSZ | $\#\|Z\| > 2$ |
| 2 | NAD | B | 1432 | - | 42,48,48 | 2.17 | 9 (21%) | 50,73,73 | 2.16 | 12 (24%) |
| 2 | NAD | A | 432 | - | 42,48,48 | 2.09 | 9 (21%) | 50,73,73 | 2.12 | 12 (24%) |
| 2 | NAD | D | 3432 | - | 42,48,48 | 2.18 | 8 (19%) | 50,73,73 | 2.12 | 12 (24%) |
| 2 | NAD | C | 2432 | - | 42,48,48 | 2.18 | 8 (19%) | 50,73,73 | 2.13 | 13 (26%) |

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

| Mol | Type | Chain | Res | Link | Chirals | Torsions | Rings |
|---|---|---|---|---|---|---|---|
| 2 | NAD | B | 1432 | - | - | 7/26/62/62 | 0/5/5/5 |
| 2 | NAD | A | 432 | - | - | 7/26/62/62 | 0/5/5/5 |
| 2 | NAD | D | 3432 | - | - | 7/26/62/62 | 0/5/5/5 |
| 2 | NAD | C | 2432 | - | - | 7/26/62/62 | 0/5/5/5 |

The worst 5 of 34 bond length outliers are listed below:

| Mol | Chain | Res | Type | Atoms | Z | Observed(Å) | Ideal(Å) |
|---|---|---|---|---|---|---|---|
| 2 | C | 2432 | NAD | C5N-C4N | 6.63 | 1.52 | 1.38 |
| 2 | B | 1432 | NAD | C5N-C4N | 6.55 | 1.52 | 1.38 |
| 2 | D | 3432 | NAD | C2N-N1N | 6.11 | 1.42 | 1.35 |
| 2 | D | 3432 | NAD | C5N-C4N | 6.07 | 1.51 | 1.38 |
| 2 | A | 432 | NAD | C5N-C4N | 6.04 | 1.51 | 1.38 |

The worst 5 of 49 bond angle outliers are listed below:

| Mol | Chain | Res | Type | Atoms | Z | Observed($^o$) | Ideal($^o$) |
|---|---|---|---|---|---|---|---|
| 2 | A | 432 | NAD | O5D-PN-O1N | -6.89 | 82.16 | 109.07 |
| 2 | C | 2432 | NAD | O5D-PN-O1N | -6.85 | 82.29 | 109.07 |
| 2 | D | 3432 | NAD | O5D-PN-O1N | -6.78 | 82.59 | 109.07 |
| 2 | B | 1432 | NAD | O5D-PN-O1N | -6.68 | 82.97 | 109.07 |
| 2 | A | 432 | NAD | C3N-C7N-N7N | 5.72 | 124.61 | 117.75 |

There are no chirality outliers.

5 of 28 torsion outliers are listed below:

| Mol | Chain | Res | Type | Atoms |
|---|---|---|---|---|
| 2 | B | 1432 | NAD | O4D-C1D-N1N-C2N |
| 2 | B | 1432 | NAD | O4D-C1D-N1N-C6N |
| 2 | B | 1432 | NAD | C2D-C1D-N1N-C2N |
| 2 | B | 1432 | NAD | C2D-C1D-N1N-C6N |
| 2 | A | 432 | NAD | O4D-C1D-N1N-C2N |

There are no ring outliers.

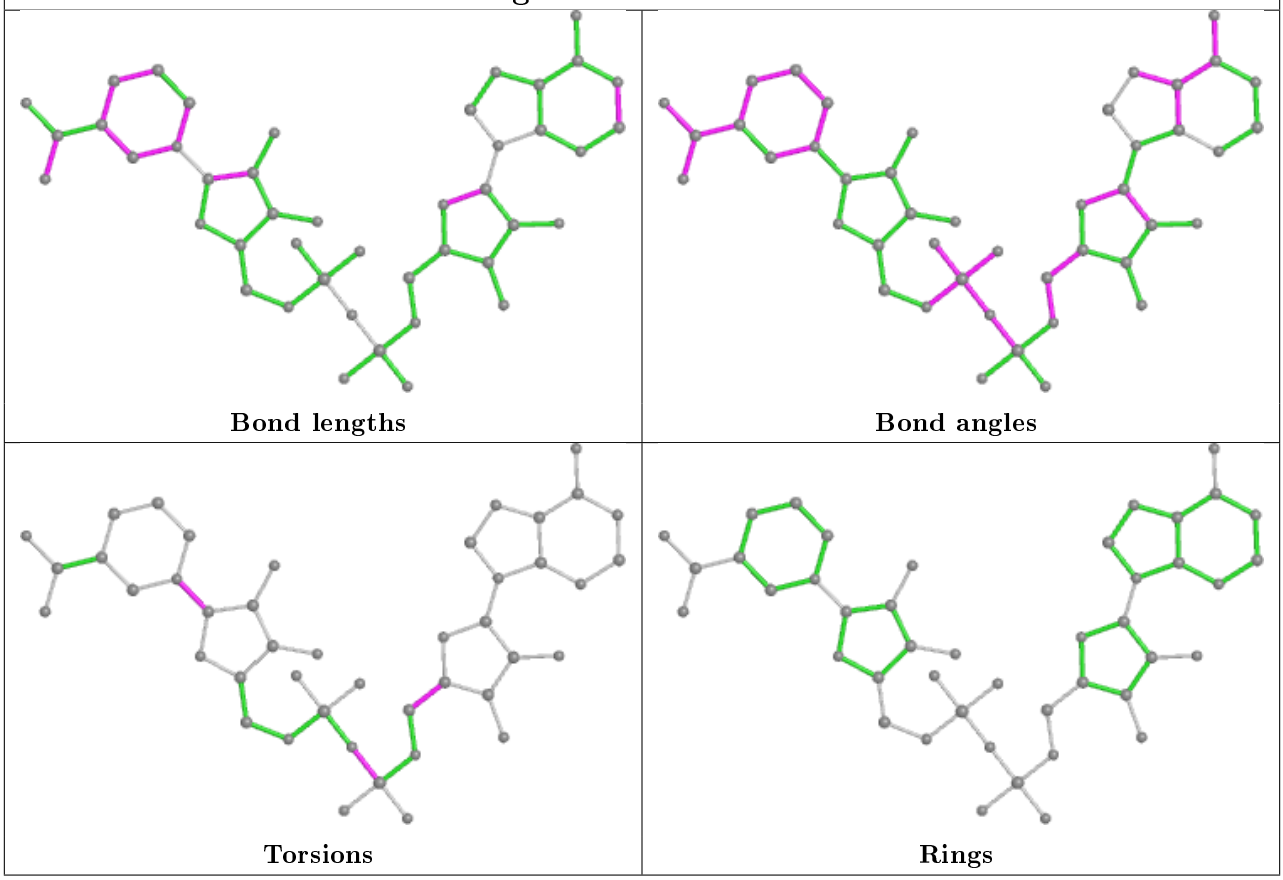
2 monomers are involved in 2 short contacts:

| Mol | Chain | Res | Type | Clashes | Symm-Clashes |
|---|---|---|---|---|---|
| 2 | A | 432 | NAD | 1 | 0 |
| 2 | C | 2432 | NAD | 1 | 0 |

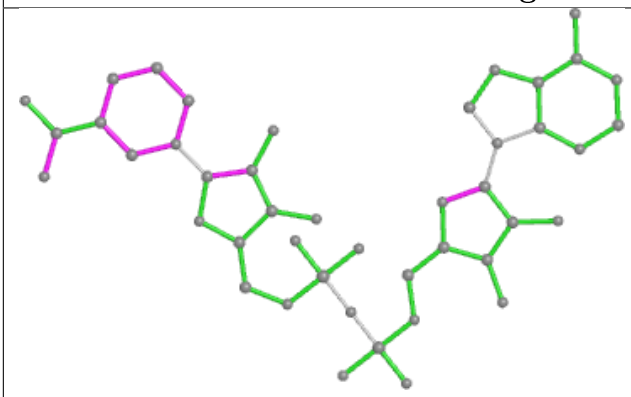
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths,

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.

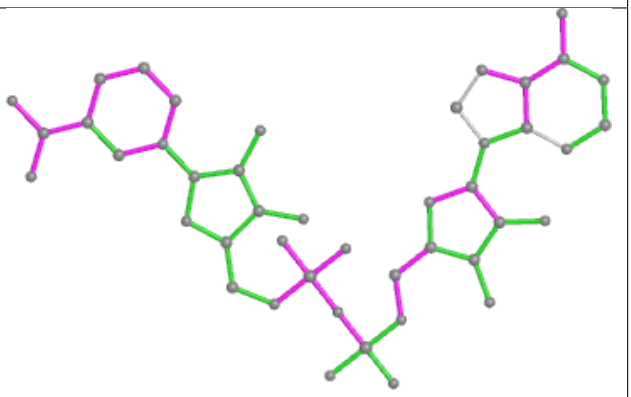
**Ligand NAD B 1432**



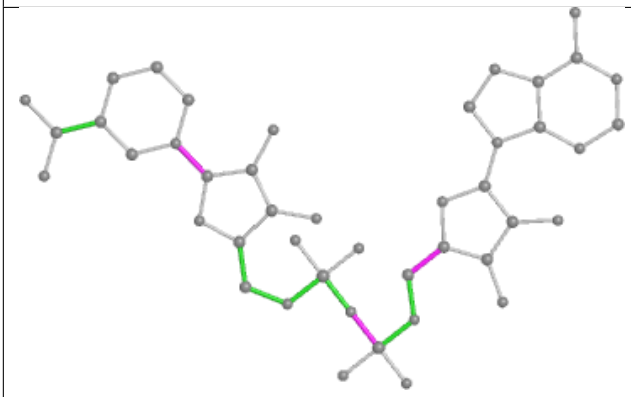
**Ligand NAD A 432**



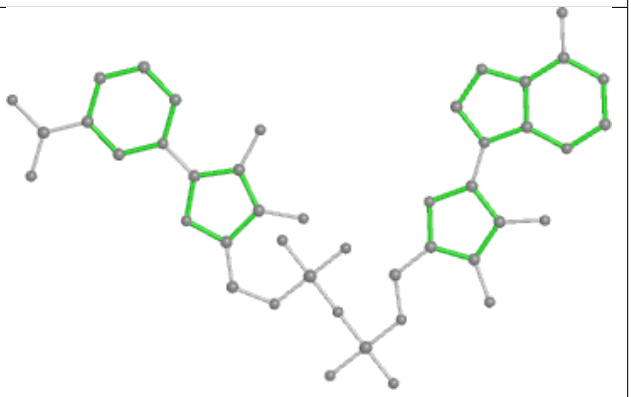
**Bond lengths**



**Bond angles**

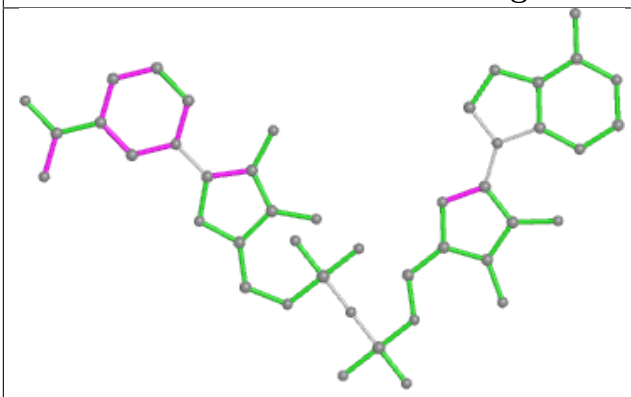


**Torsions**

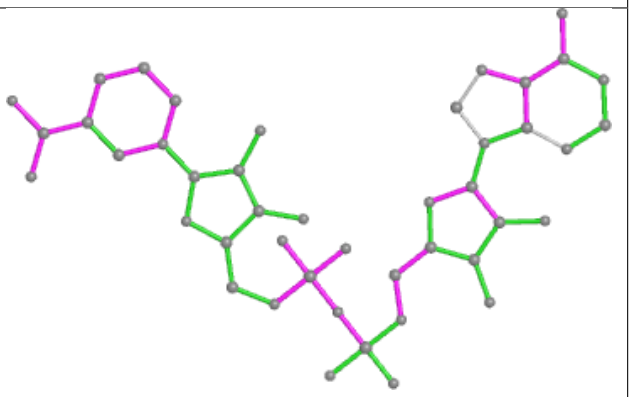


**Rings**

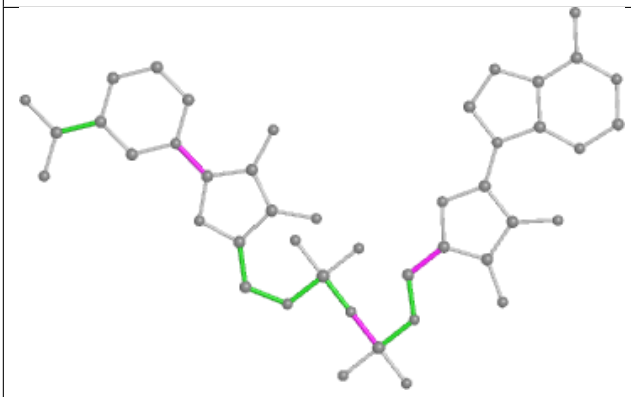
**Ligand NAD D 3432**



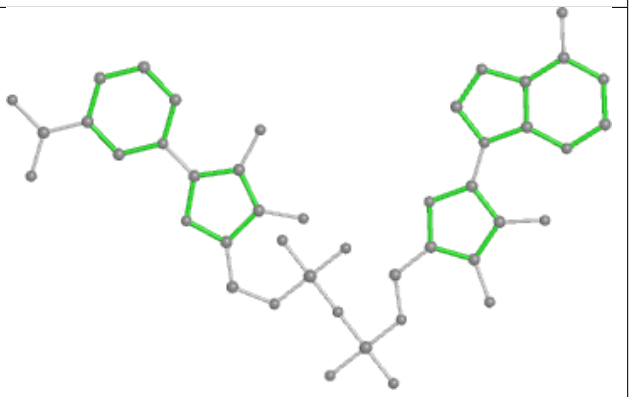
Bond lengths



Bond angles

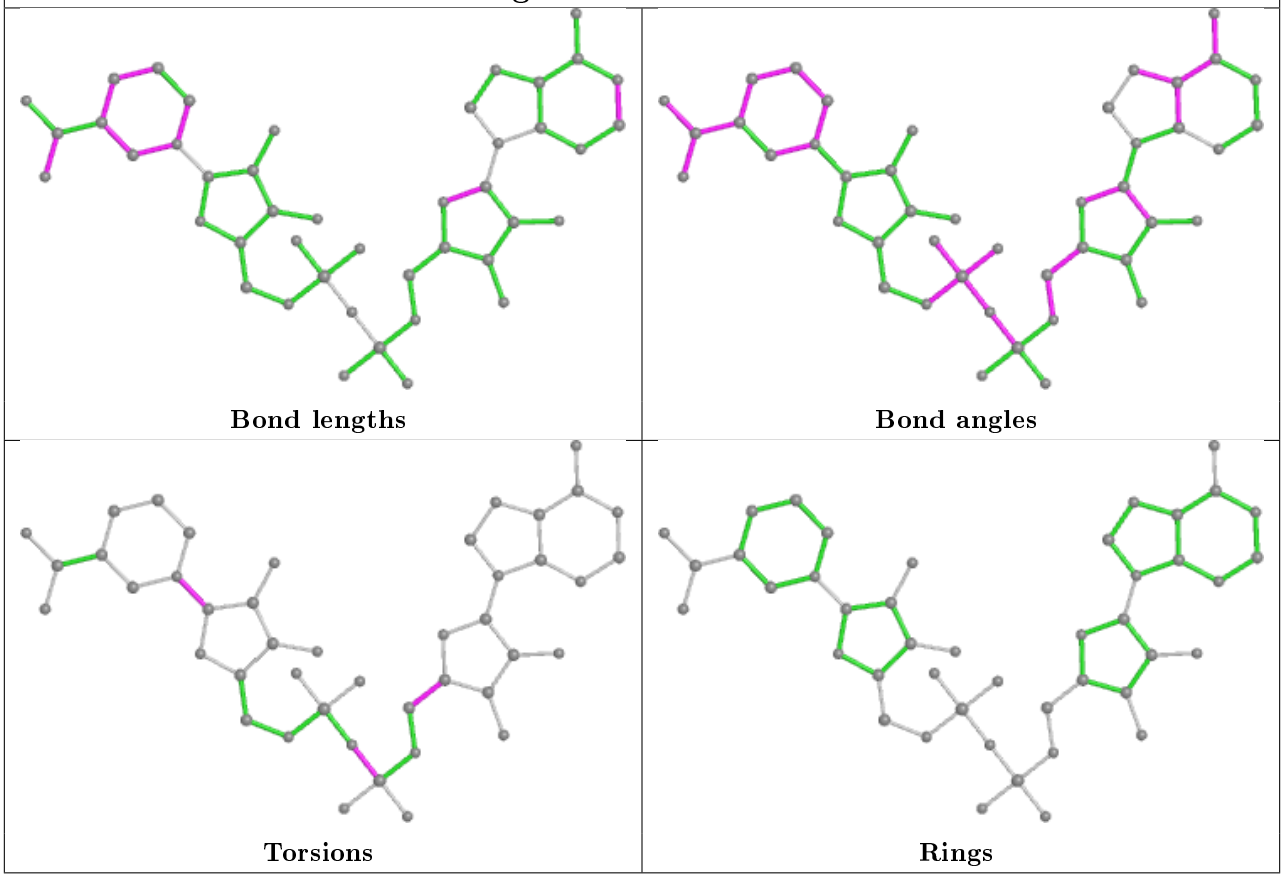


Torsions



Rings

**Ligand NAD C 2432**




## 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.