wwPDB X-ray Structure Validation Summary Report (i)

Oct 23, 2021 – 01:49 PM EDT

PDB ID	:	1CT9
Title	:	CRYSTAL STRUCTURE OF ASPARAGINE SYNTHETASE B FROM ESCHERICHIA COLI
Authors	:	Larsen, T.M.; Boehlein, S.K.; Schuster, S.M.; Richards, N.G.J.; Thoden, J.B.; Holden, H.M.; Rayment, I.
Deposited on	:	1999-08-20
Resolution	:	2.00 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:

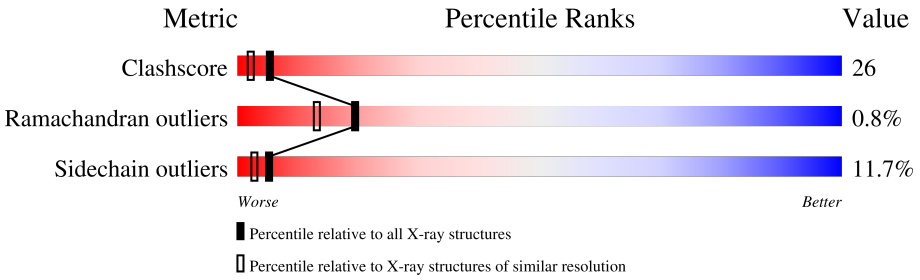
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	NOT EXECUTED
EDS	:	NOT EXECUTED
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.23.2

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 2.00 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	9178 (2.00-2.00)
Ramachandran outliers	138981	9054 (2.00-2.00)
Sidechain outliers	138945	9053 (2.00-2.00)

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	553	45% 35% 8% • 10%
1	B	553	39% 36% 13% • 10%
1	C	553	41% 37% 10% • 10%
1	D	553	48% 31% 9% • 10%

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
4	AMP	C	1114	-	-	X	-
4	AMP	D	1121	-	-	X	-

2 Entry composition (i)

There are 6 unique types of molecules in this entry. The entry contains 16980 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.

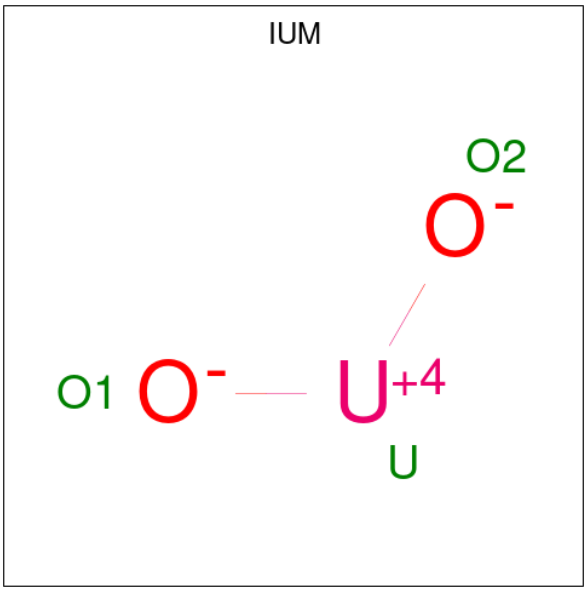
- Molecule 1 is a protein called ASPARAGINE SYNTHETASE B.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	497	Total	C	N	O	S	0	0	0
			3966	2530	671	745	20			
1	B	495	Total	C	N	O	S	0	0	0
			3942	2518	665	739	20			
1	C	495	Total	C	N	O	S	0	0	0
			3942	2518	665	739	20			
1	D	495	Total	C	N	O	S	0	0	0
			3930	2507	664	739	20			

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	1	ALA	CYS	engineered mutation	UNP P22106
B	1	ALA	CYS	engineered mutation	UNP P22106
C	1	ALA	CYS	engineered mutation	UNP P22106
D	1	ALA	CYS	engineered mutation	UNP P22106

- Molecule 2 is URANYL (VI) ION (three-letter code: IUM) (formula: O_2U).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	1	Total U 1 1	0	0
2	A	1	Total O U 2 1 1	0	0
2	A	1	Total U 1 1	0	0
2	A	1	Total U 1 1	0	0
2	B	1	Total U 1 1	0	0
2	B	1	Total U 1 1	0	0
2	B	1	Total U 1 1	0	0
2	B	1	Total U 1 1	0	0
2	C	1	Total U 1 1	0	0
2	C	1	Total U 1 1	0	0
2	C	1	Total U 1 1	0	0
2	C	1	Total U 1 1	0	0
2	D	1	Total O U 2 1 1	0	0
2	D	1	Total U 1 1	0	0

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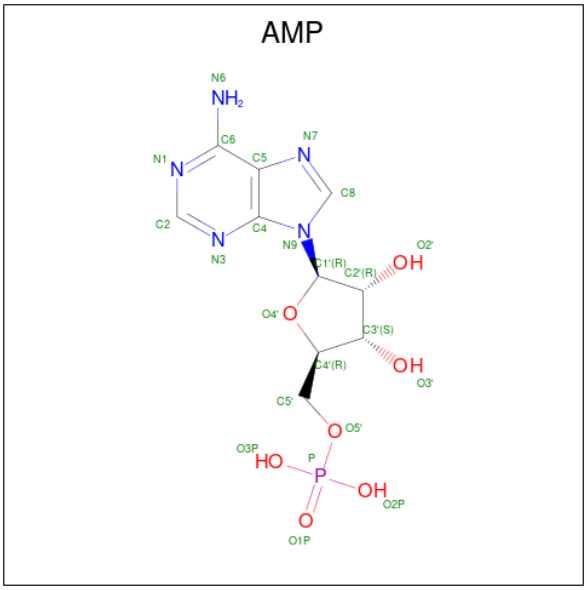
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	D	1	Total U 1 1	0	0
2	D	1	Total U 1 1	0	0

- Molecule 3 is CHLORIDE ION (three-letter code: CL) (formula: Cl).

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

- Molecule 4 is ADENOSINE MONOPHOSPHATE (three-letter code: AMP) (formula: $C_{10}H_{14}N_5O_7P$).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	1	Total C N O P 23 10 5 7 1	0	0
4	B	1	Total C N O P 23 10 5 7 1	0	0
4	C	1	Total C N O P 23 10 5 7 1	0	0

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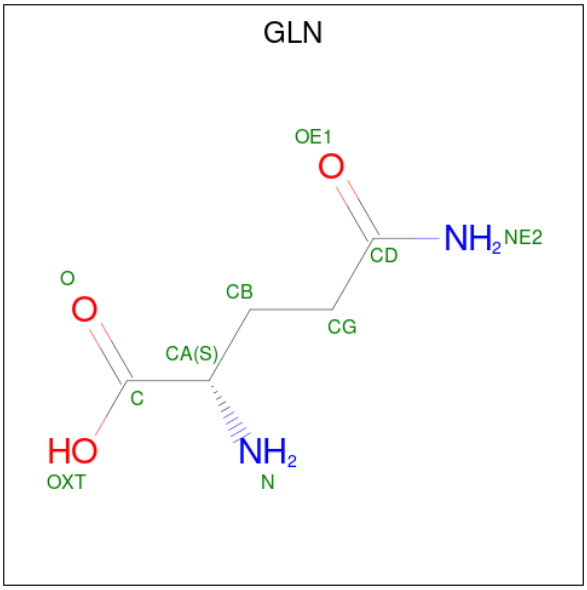
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
4	D	1	Total	C	N	O	P	0	0
			23	10	5	7	1		

- Molecule 5 is GLUTAMINE (three-letter code: GLN) (formula: $C_5H_{10}N_2O_3$).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
5	A	1	Total	C	N	O	0	0
			10	5	2	3		
5	B	1	Total	C	N	O	0	0
			10	5	2	3		
5	C	1	Total	C	N	O	0	0
			10	5	2	3		
5	D	1	Total	C	N	O	0	0
			10	5	2	3		

- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	292	Total	O	0	0
			292	292		
6	B	235	Total	O	0	0
			235	235		
6	C	223	Total	O	0	0
			223	223		
6	D	296	Total	O	0	0
			296	296		

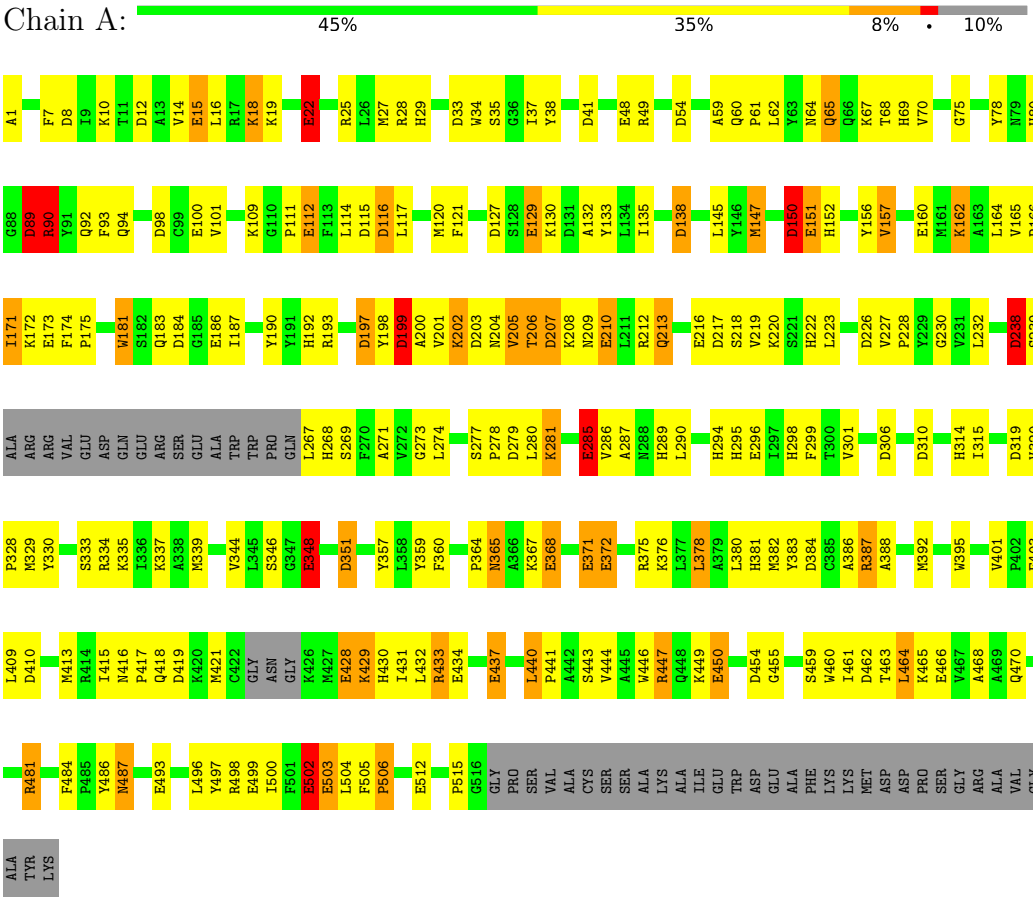
3 Residue-property plots (i)

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.

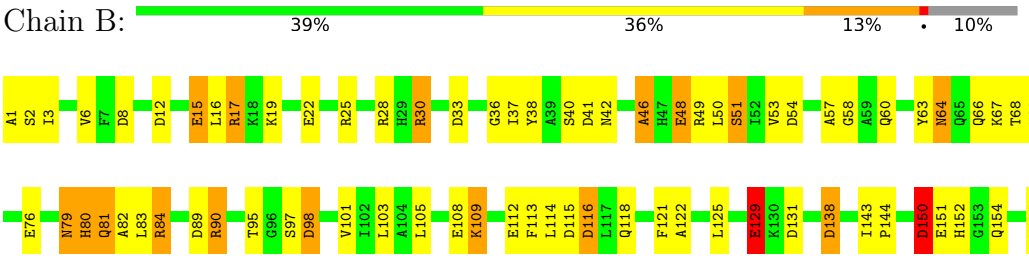
• Molecule 1: ASPARAGINE SYNTHETASE B

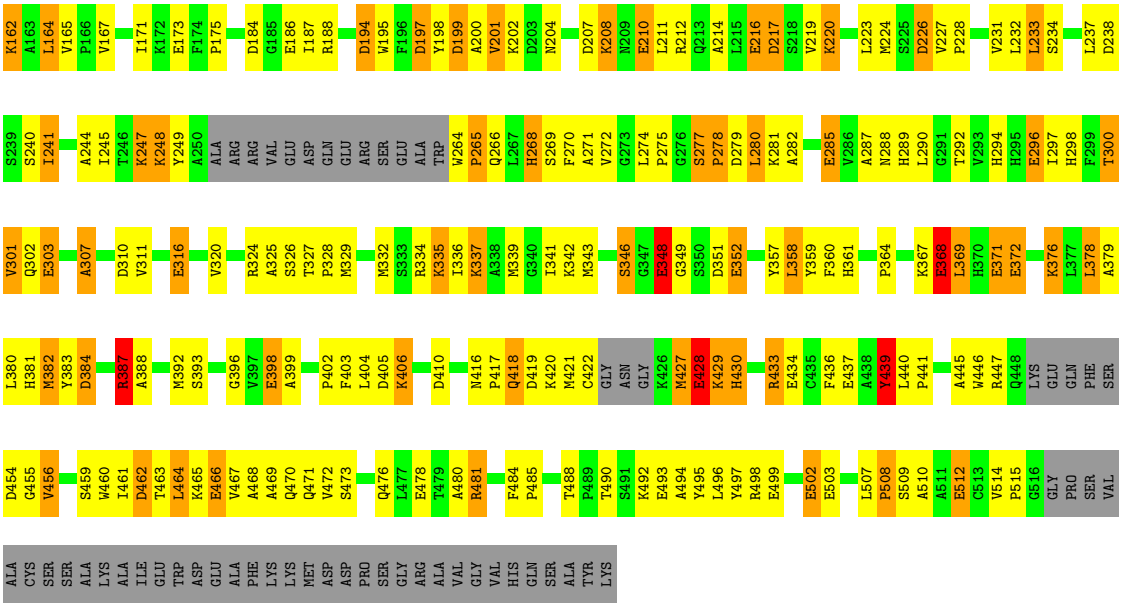
Chain A:



• Molecule 1: ASPARAGINE SYNTHETASE B

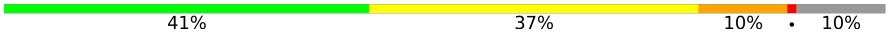
Chain B:

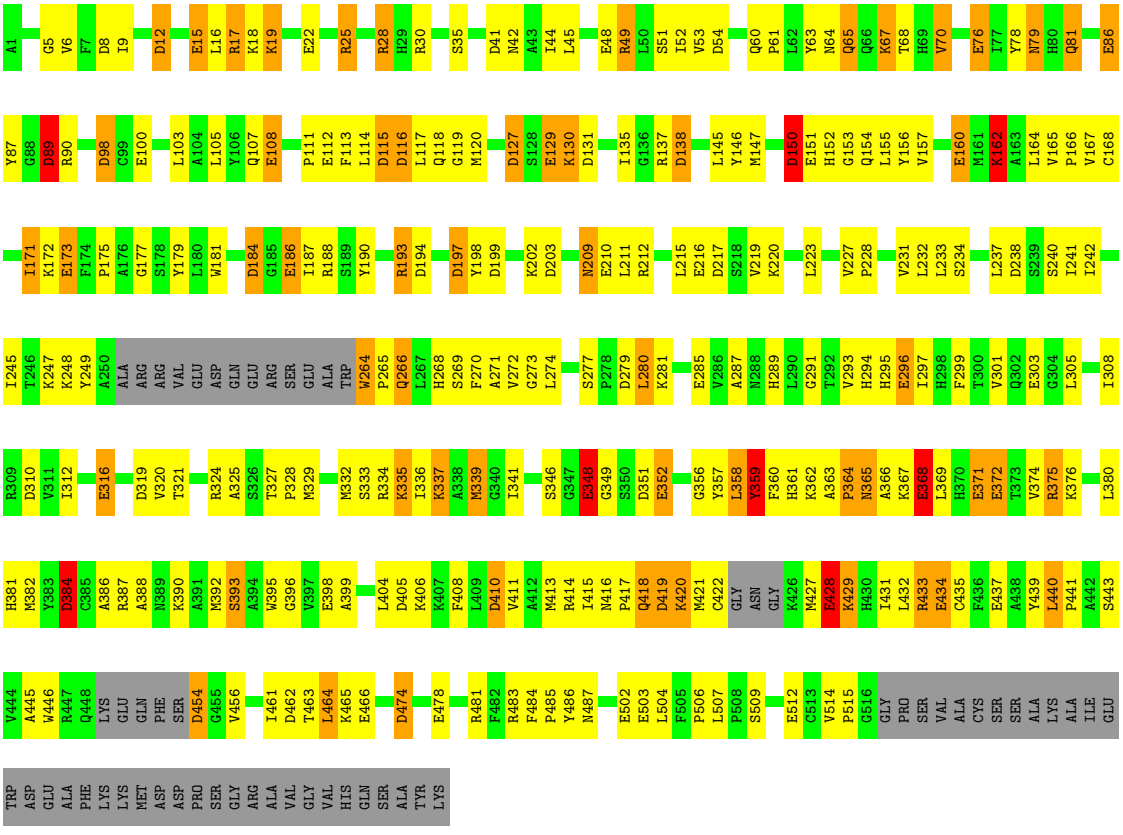




• Molecule 1: ASPARAGINE SYNTHETASE B

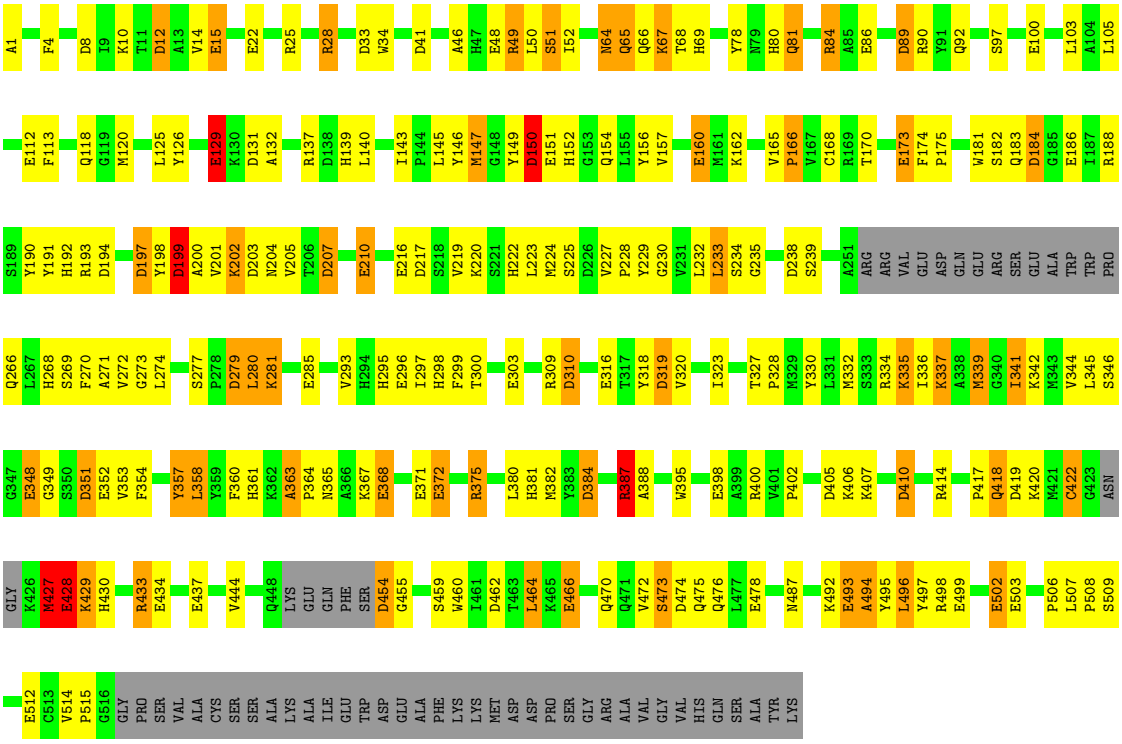
Chain C:





• Molecule 1: ASPARAGINE SYNTHETASE B

Chain D:


A1 F4 D8 I9 K10 T11 D12 A13 V14 E15 E22 R25 R28 D33 W34 D41 A46 H47 E48 R49 L50 S51 I52 N64 Q65 Q66 K67 T68 H69 Y78 N79 H80 Q81 R84 A85 E86 D89 R90 Y91 Q92 S97 E100 L103 A104 L105
E112 F113 Q118 G119 M120 L125 Y126 E129 K130 D131 A132 R137 D138 H139 L140 I143 P144 L145 Y146 M147 G148 Y149 D150 E151 H152 G153 Q154 L155 Y156 V157 E160 M161 K162 V165 P166 V167 C168 R169 T170 E173 F174 P175 W181 S182 Q183 D184 G185 E186 I187 R188
S189 Y190 Y191 H192 R193 D194 D197 Y198 D199 A200 V201 K202 D203 N204 V205 T206 D207 E210 E216 D217 S218 V219 K220 S221 H222 L223 M224 S225 D226 V227 P228 Y229 G230 V231 L232 L233 S234 G235 D238 S239 A251 ARG ARG VAL GLU ASP GLN GLU ARG SER GLU ALA TRP TRP PRO
Q266 L267 H268 S269 F270 A271 V272 G273 L274 S277 P278 D279 L280 K281 E285 V293 H294 H295 E296 I297 H298 F299 T300 E303 R309 D310 E316 T317 Y318 D319 V320 I323 T327 P328 M329 Y330 L331 M332 S333 R334 K335 I336 K337 A338 M339 G340 I341 K342 M343 V344 L345 S346
G347 E348 G349 S350 D351 E352 V353 F354 Y357 L358 Y359 F360 H361 K362 A363 P364 N365 A366 K367 E368 E371 E372 R375 L380 H381 M382 Y383 D384 R387 A388 W395 E398 A399 R400 V401 P402 D405 K406 K407 D410 R414 P417 Q418 D419 K420 M421 C422 G423 ASN
GLY K426 M427 E428 K429 H430 R433 E434 E437 V444 Q448 LYS GLU GLN PHE SER D454 G455 S459 W460 I461 D462 T463 L464 K465 E466 Q470 Q471 V472 S473 D474 Q475 Q476 L477 E478 N487 K492 E493 A494 Y495 L496 Y497 R498 E499 E502 E503 P506 L507 P508 S509
E512 C513 V514 P515 G516 GLY PRO SER VAL ALA CYS SER SER ALA LYS ALA ILE GLU TRP ASP GLU ALA PHE LYS LYS MET ASP ASP PRO SER GLY ARG ALA VAL GLY VAL HIS GLN SER ALA TYR LYS

4 Data and refinement statistics (i)

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

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α, β, γ	99.93Å 127.10Å 204.51Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	30.00 – 2.00	Depositor
% Data completeness (in resolution range)	99.0 (30.00-2.00)	Depositor
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	TNT	Depositor
R, R_{free}	0.197 , 0.297	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	16980	wwPDB-VP
Average B, all atoms (Å^2)	36.0	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: IUM, CL, AMP

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	1.02	24/4060 (0.6%)	1.48	66/5493 (1.2%)
1	B	1.04	32/4037 (0.8%)	1.50	67/5466 (1.2%)
1	C	1.01	33/4037 (0.8%)	1.44	63/5466 (1.2%)
1	D	1.06	30/4022 (0.7%)	1.49	67/5443 (1.2%)
All	All	1.03	119/16156 (0.7%)	1.48	263/21868 (1.2%)

The worst 5 of 119 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	D	478	GLU	CD-OE2	9.23	1.35	1.25
1	D	398	GLU	CD-OE2	8.52	1.35	1.25
1	B	466	GLU	CD-OE2	7.96	1.34	1.25
1	D	48	GLU	CD-OE2	7.61	1.34	1.25
1	B	296	GLU	CD-OE2	7.58	1.33	1.25

The worst 5 of 263 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	B	150	ASP	CB-CG-OD2	-14.12	105.59	118.30
1	A	150	ASP	CB-CG-OD2	-13.62	106.05	118.30
1	C	150	ASP	CB-CG-OD2	-10.79	108.59	118.30
1	D	194	ASP	CB-CG-OD1	10.22	127.50	118.30
1	B	238	ASP	CB-CG-OD2	-10.11	109.20	118.30

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	3966	0	3862	192	0
1	B	3942	0	3828	247	0
1	C	3942	0	3827	204	0
1	D	3930	0	3818	186	0
2	A	5	0	0	0	0
2	B	4	0	0	0	0
2	C	4	0	0	0	0
2	D	5	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	23	0	11	5	0
4	B	23	0	12	3	0
4	C	23	0	11	7	0
4	D	23	0	12	8	0
5	A	10	0	7	2	0
5	B	10	0	7	4	0
5	C	10	0	7	1	0
5	D	10	0	7	2	0
6	A	292	0	0	8	0
6	B	235	0	0	13	0
6	C	223	0	0	7	0
6	D	296	0	0	19	0
All	All	16980	0	15409	822	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 26.

The worst 5 of 822 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:364:PRO:HG2	1:C:368:GLU:HG2	1.26	1.17
1:D:472:VAL:HB	1:D:492:LYS:HG2	1.22	1.12
1:D:364:PRO:HG2	1:D:368:GLU:HG2	1.40	1.01

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:300:THR:HG22	1:B:303:GLU:H	1.29	0.96
1:D:64:ASN:HB3	1:D:67:LYS:N	1.80	0.95

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	491/553 (89%)	465 (95%)	24 (5%)	2 (0%)	34 30
1	B	487/553 (88%)	449 (92%)	31 (6%)	7 (1%)	11 5
1	C	487/553 (88%)	450 (92%)	33 (7%)	4 (1%)	19 13
1	D	487/553 (88%)	467 (96%)	18 (4%)	2 (0%)	34 30
All	All	1952/2212 (88%)	1831 (94%)	106 (5%)	15 (1%)	19 13

5 of 15 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	428	GLU
1	C	266	GLN
1	A	138	ASP
1	B	265	PRO
1	B	460	TRP

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	418/462 (90%)	371 (89%)	47 (11%)	6 3
1	B	414/462 (90%)	358 (86%)	56 (14%)	4 2
1	C	414/462 (90%)	364 (88%)	50 (12%)	5 2
1	D	412/462 (89%)	371 (90%)	41 (10%)	7 4
All	All	1658/1848 (90%)	1464 (88%)	194 (12%)	5 3

5 of 194 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	150	ASP
1	C	420	LYS
1	C	171	ILE
1	C	337	LYS
1	C	464	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 43 such sidechains are listed below:

Mol	Chain	Res	Type
1	C	183	GLN
1	D	81	GLN
1	C	288	ASN
1	C	471	GLN
1	D	192	HIS

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 28 ligands modelled in this entry, 14 are modelled with single atom and 4 are monoatomic - leaving 10 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	$\#\|Z\| > 2$
4	AMP	B	1107	2	22,25,25	1.19	3 (13%)	25,38,38	1.49	4 (16%)
2	IUM	A	1102	-	0,1,2	-	-	-		
5	GLN	C	1120	-	5,9,9	2.28	1 (20%)	5,11,11	1.29	1 (20%)
2	IUM	D	1122	4	0,1,2	-	-	-		
5	GLN	A	1106	-	5,9,9	2.86	1 (20%)	5,11,11	0.86	0
4	AMP	D	1121	2	22,25,25	1.00	2 (9%)	25,38,38	2.44	6 (24%)
5	GLN	B	1113	-	5,9,9	2.25	1 (20%)	5,11,11	0.46	0
4	AMP	A	1100	-	22,25,25	1.20	3 (13%)	25,38,38	1.87	4 (16%)
4	AMP	C	1114	-	22,25,25	1.19	3 (13%)	25,38,38	2.12	7 (28%)
5	GLN	D	1127	-	5,9,9	2.21	1 (20%)	5,11,11	0.45	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
4	AMP	B	1107	2	-	0/6/26/26	0/3/3/3
5	GLN	C	1120	-	-	0/5/9/9	-
5	GLN	A	1106	-	-	0/5/9/9	-
4	AMP	D	1121	2	-	6/6/26/26	0/3/3/3
5	GLN	B	1113	-	-	0/5/9/9	-
4	AMP	A	1100	-	-	0/6/26/26	0/3/3/3
4	AMP	C	1114	-	-	0/6/26/26	0/3/3/3
5	GLN	D	1127	-	-	0/5/9/9	-

The worst 5 of 15 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	A	1106	GLN	CA-N	-6.31	1.33	1.47
5	B	1113	GLN	CA-N	-5.00	1.35	1.47
5	C	1120	GLN	CA-N	-4.99	1.35	1.47
5	D	1127	GLN	CA-N	-4.77	1.36	1.47
4	C	1114	AMP	O2'-C2'	3.19	1.50	1.43

The worst 5 of 22 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
4	D	1121	AMP	C5-C6-N6	6.53	130.28	120.35
4	D	1121	AMP	O2P-P-O5'	-5.78	91.36	106.73
4	C	1114	AMP	C2'-C3'-C4'	-5.57	91.82	102.64
4	A	1100	AMP	O3'-C3'-C2'	5.12	128.39	111.82
4	D	1121	AMP	C2'-C3'-C4'	-4.50	93.90	102.64

There are no chirality outliers.

5 of 6 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	D	1121	AMP	C5'-O5'-P-O1P
4	D	1121	AMP	C5'-O5'-P-O2P
4	D	1121	AMP	C5'-O5'-P-O3P
4	D	1121	AMP	O4'-C4'-C5'-O5'
4	D	1121	AMP	C3'-C4'-C5'-O5'

There are no ring outliers.

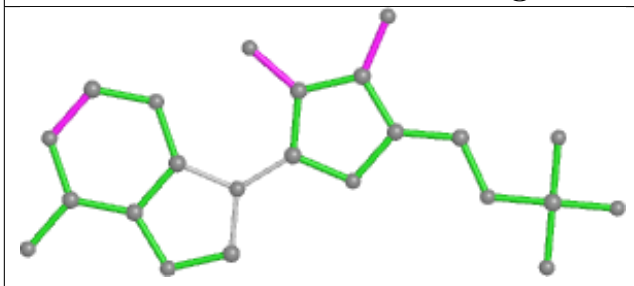
8 monomers are involved in 32 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	B	1107	AMP	3	0
5	C	1120	GLN	1	0
5	A	1106	GLN	2	0
4	D	1121	AMP	8	0
5	B	1113	GLN	4	0
4	A	1100	AMP	5	0
4	C	1114	AMP	7	0
5	D	1127	GLN	2	0

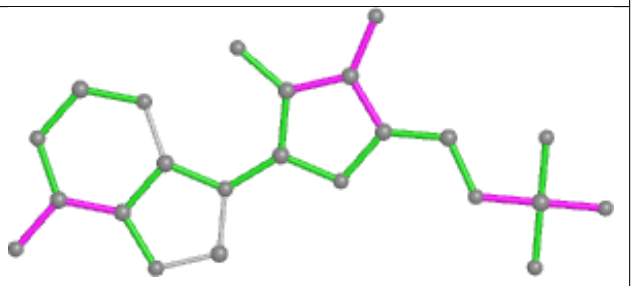
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included.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

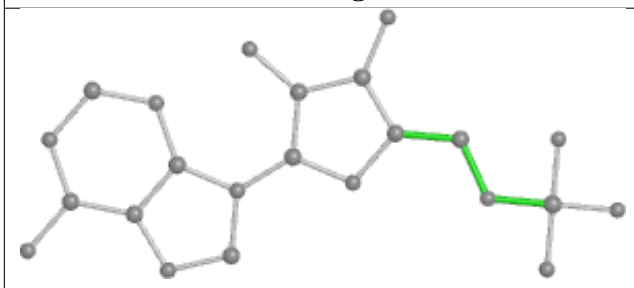
Ligand AMP B 1107



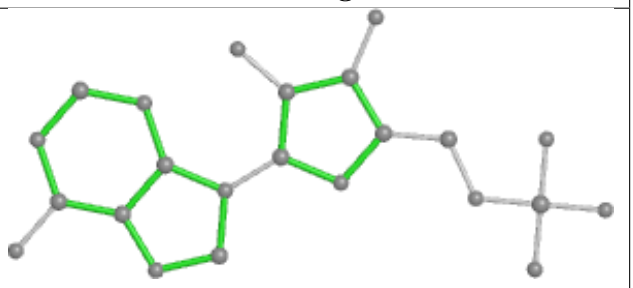
Bond lengths



Bond angles

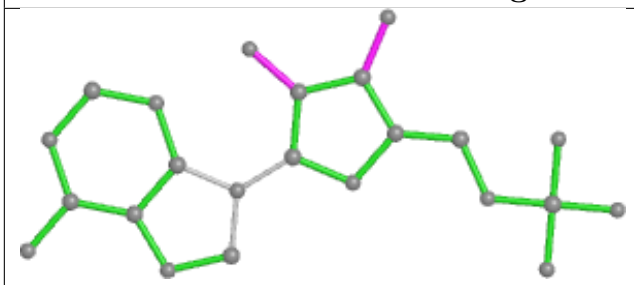


Torsions

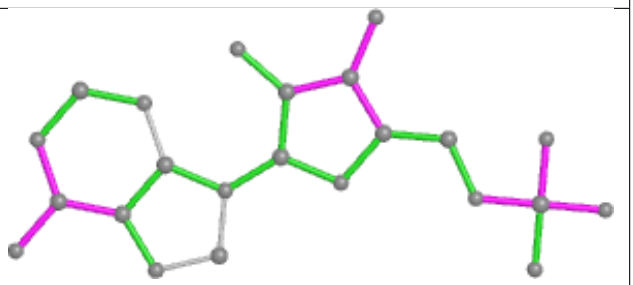


Rings

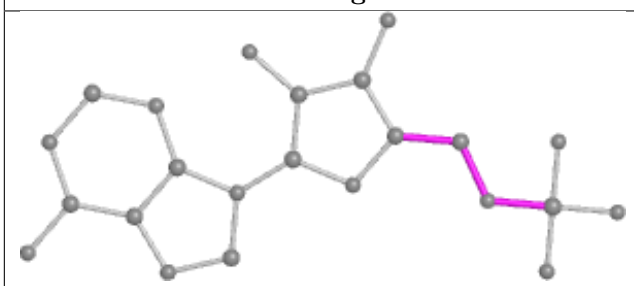
Ligand AMP D 1121



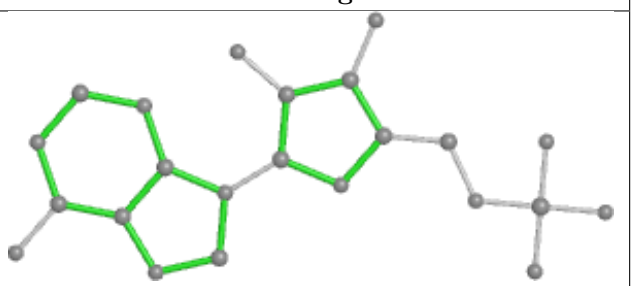
Bond lengths



Bond angles

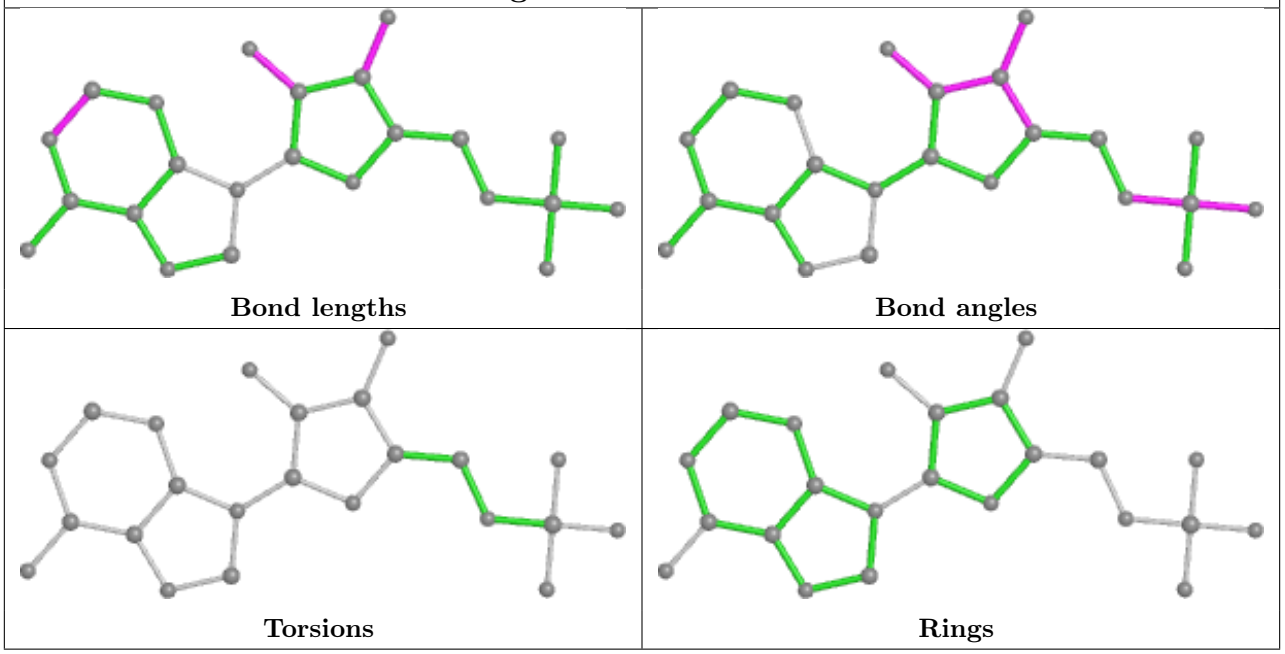


Torsions

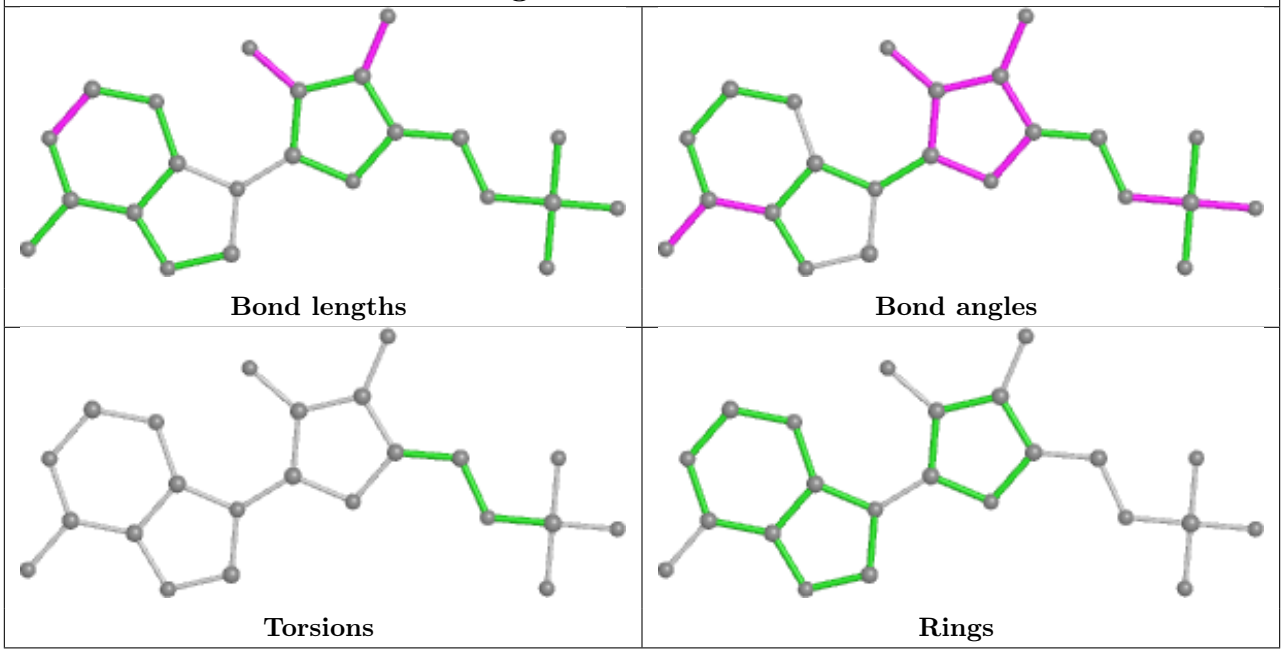


Rings

Ligand AMP A 1100



Ligand AMP C 1114



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.