



# wwPDB X-ray Structure Validation Summary Report ⓘ

Jan 31, 2016 – 08:19 PM GMT

PDB ID : 1JU2  
Title : Crystal structure of the hydroxynitrile lyase from almond  
Authors : Dreveny, I.; Gruber, K.; Glieder, A.; Thompson, A.; Kratky, C.  
Deposited on : 2001-08-23  
Resolution : 1.47 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](mailto:validation@mail.wwpdb.org)  
A user guide is available at  
<http://wwpdb.org/validation/2016/XrayValidationReportHelp>  
with specific help available everywhere you see the ⓘ symbol.

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

MolProbity : 4.02b-467  
Mogul : 1.7 (RC4), CSD as536be (2015)  
Xtriage (Phenix) : **NOT EXECUTED**  
EDS : **NOT EXECUTED**  
Percentile statistics : 20151230.v01 (using entries in the PDB archive December 30th 2015)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : trunk26865

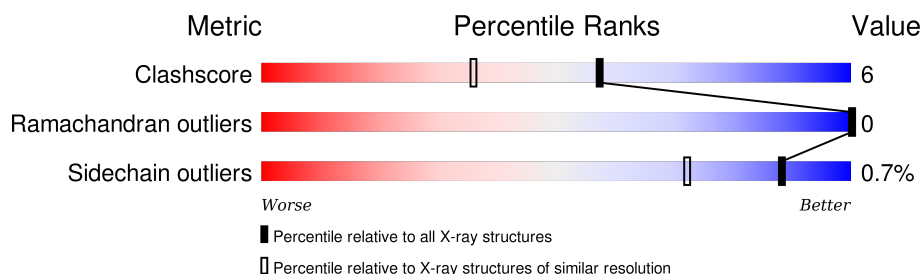
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.47 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	102246	3380 (1.50-1.46)
Ramachandran outliers	100387	3310 (1.50-1.46)
Sidechain outliers	100360	3308 (1.50-1.46)

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  $\geq 3$ , 2, 1 and 0 types of geometric quality criteria. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions  $\leq 5\%$ . The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	536	
1	B	536	

## 2 Entry composition

There are 10 unique types of molecules in this entry. The entry contains 9995 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 hydroxynitrile lyase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	521	Total	C	N	O	S	0	16	0
			4033	2556	672	797	8			
1	B	521	Total	C	N	O	S	0	11	0
			4019	2552	668	791	8			

- Molecule 2 is a polymer of unknown type called SUGAR (2-MER).

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	A	2	Total	C	N	O	0	0
			28	16	2	10		

- Molecule 3 is a polymer of unknown type called SUGAR (5-MER).

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
3	A	5	Total	C	N	O	0	0
			60	34	2	24		
3	B	5	Total	C	N	O	0	0
			60	34	2	24		

- Molecule 4 is a polymer of unknown type called SUGAR (5-MER).

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
4	A	5	Total	C	N	O	0	0
			60	34	2	24		

- Molecule 5 is SUGAR (N-ACETYL-D-GLUCOSAMINE) (three-letter code: NAG) (formula: C<sub>8</sub>H<sub>15</sub>NO<sub>6</sub>).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
5	A	1	Total	C	N	O	0	0
			14	8	1	5		
5	B	1	Total	C	N	O	0	0
			14	8	1	5		

- Molecule 6 is a polymer of unknown type called SUGAR (2-MER).

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
6	B	2	Total	C	N	O	0	0
			28	16	2	10		

- Molecule 7 is a polymer of unknown type called SUGAR (4-MER).

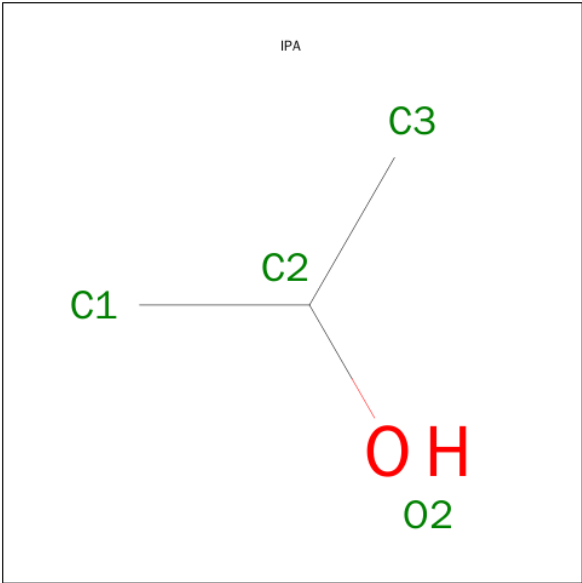
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
7	B	4	Total	C	N	O	0	0
			49	28	2	19		

- Molecule 8 is FLAVIN-ADENINE DINUCLEOTIDE (three-letter code: FAD) (formula:  $C_{27}H_{33}N_9O_{15}P_2$ ).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
8	A	1	Total 53	C 27	N 9	O 15	P 2	0	0
8	B	1	Total 53	C 27	N 9	O 15	P 2	0	0

- Molecule 9 is ISOPROPYL ALCOHOL (three-letter code: IPA) (formula: C<sub>3</sub>H<sub>8</sub>O).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
9	A	1	Total	C	O	0	0
			4	3	1		
9	B	1	Total	C	O	0	0
			4	3	1		

- Molecule 10 is water.

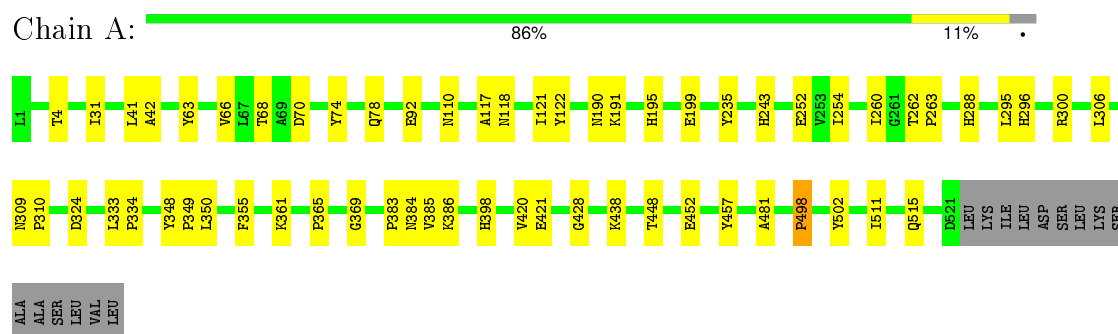
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
10	A	753	Total 753	O 753	0	0
10	B	763	Total 763	O 763	0	0

### 3 Residue-property plots

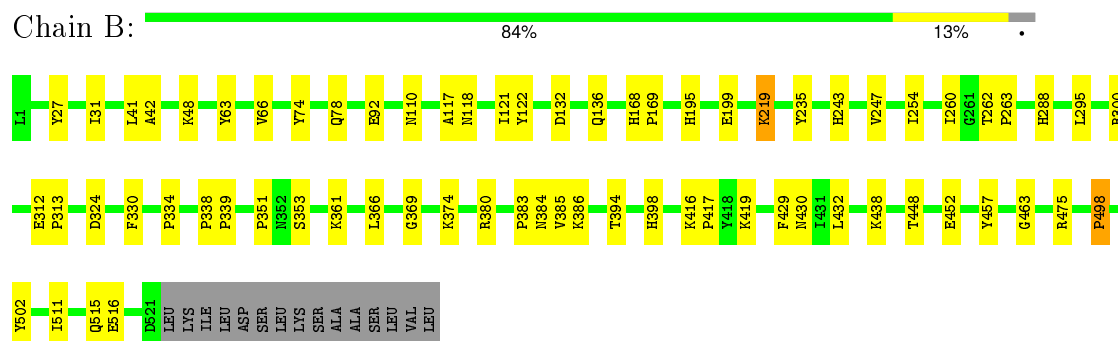
These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of errors displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are color-coded according 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 ( $\text{RSRZ} > 2$ ). 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.

Note EDS was not executed.

- Molecule 1: hydroxynitrile lyase



- Molecule 1: hydroxynitrile lyase



## 4 Data and refinement statistics

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

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	56.18 Å   67.49 Å   79.80 Å 79.57°   77.78°   67.19°	Depositor
Resolution (Å)	23.23 – 1.47	Depositor
% Data completeness (in resolution range)	69.2 (23.23-1.47)	Depositor
$R_{merge}$	0.04	Depositor
$R_{sym}$	(Not available)	Depositor
Refinement program	CNS 1.1	Depositor
R, $R_{free}$	0.160 , 0.186	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	9995	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	16.0	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: BMA, NAG, NDG, IPA, FUC, FAD, MAN

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	0.30	0/4223	0.63	0/5760
1	B	0.30	0/4182	0.63	0/5705
All	All	0.30	0/8405	0.63	0/11465

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	4033	0	3881	43	0
1	B	4019	0	3877	52	0
2	A	28	0	25	0	0
3	A	60	0	52	0	0
3	B	60	0	52	0	0
4	A	60	0	52	0	0
5	A	14	0	13	1	0
5	B	14	0	13	1	0
6	B	28	0	25	3	0
7	B	49	0	43	1	0
8	A	53	0	31	4	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
8	B	53	0	31	2	0
9	A	4	0	8	1	0
9	B	4	0	8	1	0
10	A	753	0	0	3	0
10	B	763	0	0	5	0
All	All	9995	0	8111	100	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 6.

The worst 5 of 100 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:420:VAL:HG23	1:A:421:GLU:HG3	1.58	0.84
1:A:121[B]:ILE:HD12	9:A:4001:IPA:H2	1.60	0.83
1:B:121[B]:ILE:HD12	9:B:4002:IPA:H2	1.60	0.83
1:B:374:LYS:HE2	1:B:384[A]:ASN:HD21	1.46	0.81
1:A:118:ASN:O	1:A:121[B]:ILE:HG12	1.87	0.73

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	535/536 (100%)	522 (98%)	13 (2%)	0	100	100
1	B	530/536 (99%)	516 (97%)	14 (3%)	0	100	100
All	All	1065/1072 (99%)	1038 (98%)	27 (2%)	0	100	100

There are no Ramachandran outliers to report.

### 5.3.2 Protein sidechains ⓘ

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	459/456 (101%)	457 (100%)	2 (0%)	93	84
1	B	454/456 (100%)	450 (99%)	4 (1%)	84	64
All	All	913/912 (100%)	907 (99%)	6 (1%)	88	72

5 of 6 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	219	LYS
1	B	498	PRO
1	B	288	HIS
1	A	498	PRO
1	B	430	ASN

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 7 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	65	ASN
1	B	430	ASN
1	B	281	ASN
1	A	224	ASN
1	B	323	ASN

### 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 ⓘ

23 carbohydrates 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	NAG	A	537	1,2	14,14,15	0.73	0	15,19,21	0.77	0
2	NDG	A	538	2	14,14,15	0.73	1 (7%)	15,19,21	0.83	1 (6%)
3	NAG	A	539	1,3	14,14,15	0.52	0	15,19,21	0.80	1 (6%)
3	NAG	A	540	3	14,14,15	0.52	0	15,19,21	0.66	0
3	FUC	A	541	3	10,10,11	0.49	0	14,14,16	0.51	0
3	BMA	A	542	3	11,11,12	0.46	0	14,15,17	0.40	0
3	MAN	A	543	3	11,11,12	0.48	0	14,15,17	0.57	0
4	NAG	A	544	1,4	14,14,15	0.52	0	15,19,21	0.72	1 (6%)
4	NAG	A	545	4	14,14,15	0.47	0	15,19,21	0.71	1 (6%)
4	FUC	A	546	4	10,10,11	0.47	0	14,14,16	0.54	0
4	BMA	A	547	4	11,11,12	0.43	0	14,15,17	0.30	0
4	BMA	A	548	4	11,11,12	0.57	0	14,15,17	0.80	1 (7%)
6	NAG	B	537	1,6	14,14,15	0.53	0	15,19,21	0.62	0
6	NAG	B	538	6	14,14,15	0.46	0	15,19,21	0.82	1 (6%)
3	NAG	B	539	1,3	14,14,15	0.53	0	15,19,21	0.80	1 (6%)
3	NAG	B	540	3	14,14,15	0.49	0	15,19,21	0.72	1 (6%)
3	FUC	B	541	3	10,10,11	0.47	0	14,14,16	0.54	0
3	BMA	B	542	3	11,11,12	0.44	0	14,15,17	0.43	0
3	MAN	B	543	3	11,11,12	0.47	0	14,15,17	0.55	0
7	NAG	B	544	1,7	14,14,15	0.51	0	15,19,21	0.71	1 (6%)
7	NAG	B	545	7	14,14,15	0.61	0	15,19,21	1.10	3 (20%)
7	FUC	B	546	7	10,10,11	0.47	0	14,14,16	0.52	0
7	BMA	B	547	7	11,11,12	0.47	0	14,15,17	0.46	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
2	NAG	A	537	1,2	-	0/6/23/26	0/1/1/1
2	NDG	A	538	2	-	0/6/23/26	0/1/1/1
3	NAG	A	539	1,3	-	0/6/23/26	0/1/1/1
3	NAG	A	540	3	-	0/6/23/26	0/1/1/1
3	FUC	A	541	3	-	0/0/17/20	0/1/1/1
3	BMA	A	542	3	-	0/2/19/22	0/1/1/1
3	MAN	A	543	3	-	0/2/19/22	0/1/1/1
4	NAG	A	544	1,4	-	0/6/23/26	0/1/1/1
4	NAG	A	545	4	-	0/6/23/26	0/1/1/1
4	FUC	A	546	4	-	0/0/17/20	0/1/1/1
4	BMA	A	547	4	-	0/2/19/22	0/1/1/1
4	BMA	A	548	4	-	0/2/19/22	1/1/1/1
6	NAG	B	537	1,6	-	0/6/23/26	0/1/1/1
6	NAG	B	538	6	-	0/6/23/26	0/1/1/1
3	NAG	B	539	1,3	-	0/6/23/26	0/1/1/1
3	NAG	B	540	3	-	0/6/23/26	0/1/1/1
3	FUC	B	541	3	-	0/0/17/20	0/1/1/1
3	BMA	B	542	3	-	0/2/19/22	0/1/1/1
3	MAN	B	543	3	-	0/2/19/22	0/1/1/1
7	NAG	B	544	1,7	-	0/6/23/26	0/1/1/1
7	NAG	B	545	7	-	0/6/23/26	0/1/1/1
7	FUC	B	546	7	-	0/0/17/20	0/1/1/1
7	BMA	B	547	7	-	0/2/19/22	0/1/1/1

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	538	NDG	C1-C2	2.13	1.55	1.52

The worst 5 of 12 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
6	B	538	NAG	C2-N2-C7	-2.46	119.88	123.04
3	B	539	NAG	C2-N2-C7	-2.42	119.93	123.04
2	A	538	NDG	C2-N2-C7	-2.25	120.15	123.04
4	A	544	NAG	C2-N2-C7	-2.21	120.19	123.04
7	B	544	NAG	C2-N2-C7	-2.20	120.21	123.04

There are no chirality outliers.

There are no torsion outliers.

All (1) ring outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	A	548	BMA	C1-C2-C3-C4-C5-O5

4 monomers are involved in 4 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
6	B	537	NAG	3	0
6	B	538	NAG	3	0
7	B	545	NAG	1	0
7	B	547	BMA	1	0

## 5.6 Ligand geometry [i](#)

6 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	FAD	A	2001	-	48,58,58	2.04	16 (33%)	54,89,89	1.87	9 (16%)
9	IPA	A	4001	-	3,3,3	0.53	0	3,3,3	0.81	0
5	NAG	A	607	1	14,14,15	0.58	0	15,19,21	0.73	1 (6%)
8	FAD	B	2002	-	48,58,58	2.04	16 (33%)	54,89,89	1.85	10 (18%)
9	IPA	B	4002	-	3,3,3	0.52	0	3,3,3	0.83	0
5	NAG	B	607	1	14,14,15	0.64	0	15,19,21	0.90	1 (6%)

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	FAD	A	2001	-	-	0/30/50/50	0/6/6/6
9	IPA	A	4001	-	-	0/0/0/0	0/0/0/0
5	NAG	A	607	1	-	0/6/23/26	0/1/1/1
8	FAD	B	2002	-	-	0/30/50/50	0/6/6/6
9	IPA	B	4002	-	-	0/0/0/0	0/0/0/0
5	NAG	B	607	1	-	0/6/23/26	0/1/1/1

The worst 5 of 32 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
8	A	2001	FAD	PA-O2A	-4.13	1.37	1.54
8	B	2002	FAD	PA-O2A	-4.09	1.37	1.54
8	B	2002	FAD	P-O2P	-3.50	1.40	1.54
8	A	2001	FAD	P-O2P	-3.45	1.40	1.54
8	A	2001	FAD	C10-N10	-2.32	1.36	1.39

The worst 5 of 21 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
8	B	2002	FAD	C4X-C4-N3	-4.85	116.95	123.59
8	A	2001	FAD	C4X-C4-N3	-4.71	117.15	123.59
8	A	2001	FAD	N3A-C2A-N1A	-3.96	125.86	128.89
8	B	2002	FAD	N3A-C2A-N1A	-3.88	125.93	128.89
8	A	2001	FAD	C4-C4X-C10	-3.83	117.49	119.94

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

6 monomers are involved in 10 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
8	A	2001	FAD	4	0
9	A	4001	IPA	1	0
5	A	607	NAG	1	0
8	B	2002	FAD	2	0
9	B	4002	IPA	1	0
5	B	607	NAG	1	0

## 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 [i](#)

### 6.1 Protein, DNA and RNA chains [i](#)

EDS was not executed - this section will therefore be empty.

### 6.2 Non-standard residues in protein, DNA, RNA chains [i](#)

EDS was not executed - this section will therefore be empty.

### 6.3 Carbohydrates [i](#)

EDS was not executed - this section will therefore be empty.

### 6.4 Ligands [i](#)

EDS was not executed - this section will therefore be empty.

### 6.5 Other polymers [i](#)

EDS was not executed - this section will therefore be empty.