Full wwPDB X-ray Structure Validation Report

Jan 31, 2016 – 06:26 PM GMT

PDB ID	:	1ASG
Title	:	THE STRUCTURAL BASIS FOR THE REDUCED ACTIVITY OF THE Y226F(Y225F) ACTIVE SITE MUTANT OF E. COLI ASPARTATE AMINOTRANSFERASE
Authors	:	Schumacher, C.; Ringe, D.
Deposited on	:	1993-08-27
Resolution	:	2.80 Å(reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.
We welcome your comments at validation@mail.wwpdb.org
A user guide is available at
http://wwpdb.org/validation/2016/XrayValidationReportHelp
with specific help available everywhere you see the (i) symbol.

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

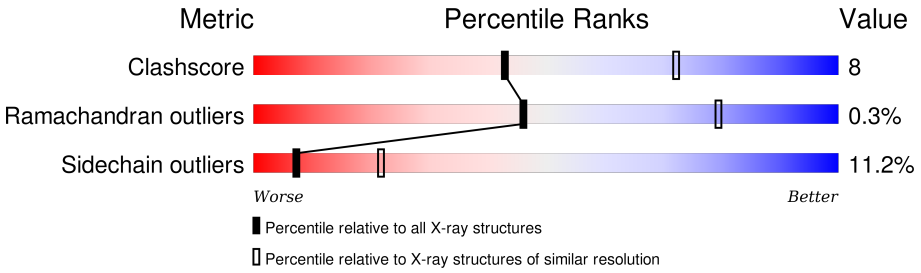
MolProbity	:	4.02b-467
Mogul	:	1.7 (RC4), CSD as536be (2015)
Xtriage (Phenix)	:	NOT EXECUTED
EDS	:	NOT EXECUTED
Percentile statistics	:	20151230.v01 (using entries in the PDB archive December 30th 2015)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)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

1 Overall quality at a glance (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	102246	2827 (2.80-2.80)
Ramachandran outliers	100387	2782 (2.80-2.80)
Sidechain outliers	100360	2784 (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. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions <=5% The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	396	72% 21%

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 3226 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.

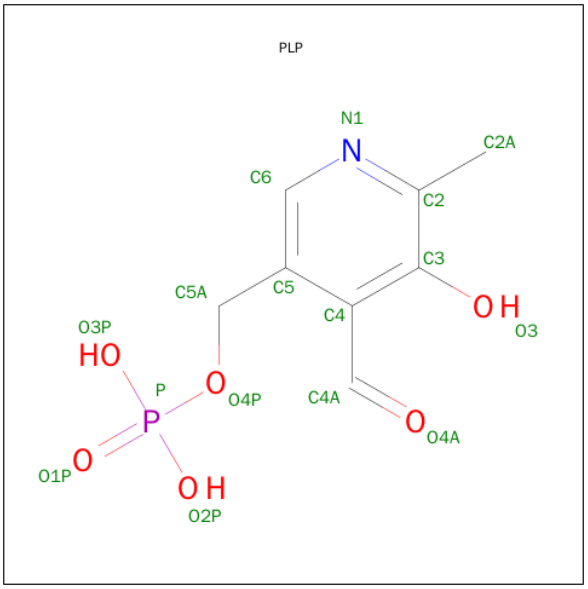
- Molecule 1 is a protein called ASPARTATE AMINOTRANSFERASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	396	3068	1936	536	583	13	0	0	0

There is a discrepancy between the modelled and reference sequences:

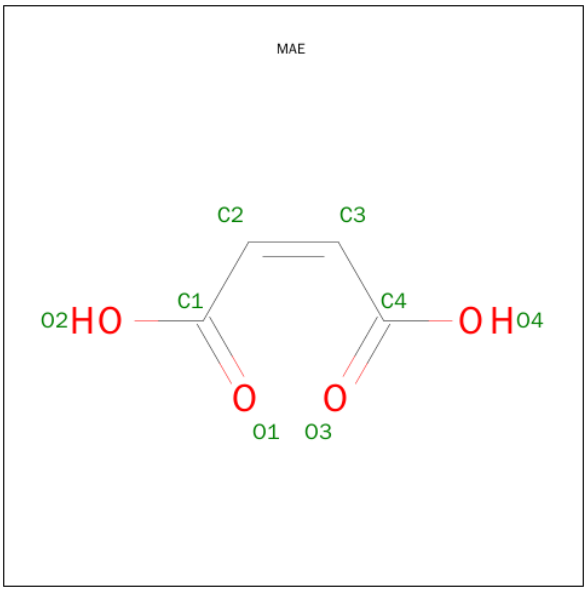
Chain	Residue	Modelled	Actual	Comment	Reference
A	226	PHE	TYR	ENGINEERED MUTATION	UNP P00509

- Molecule 2 is PYRIDOXAL-5'-PHOSPHATE (three-letter code: PLP) (formula: $C_8H_{10}NO_6P$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	P		
2	A	1	15	8	1	5	1	0	0

- Molecule 3 is MALEIC ACID (three-letter code: MAE) (formula: $C_4H_4O_4$).



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

- Molecule 4 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	135	Total O 135 135	0	0

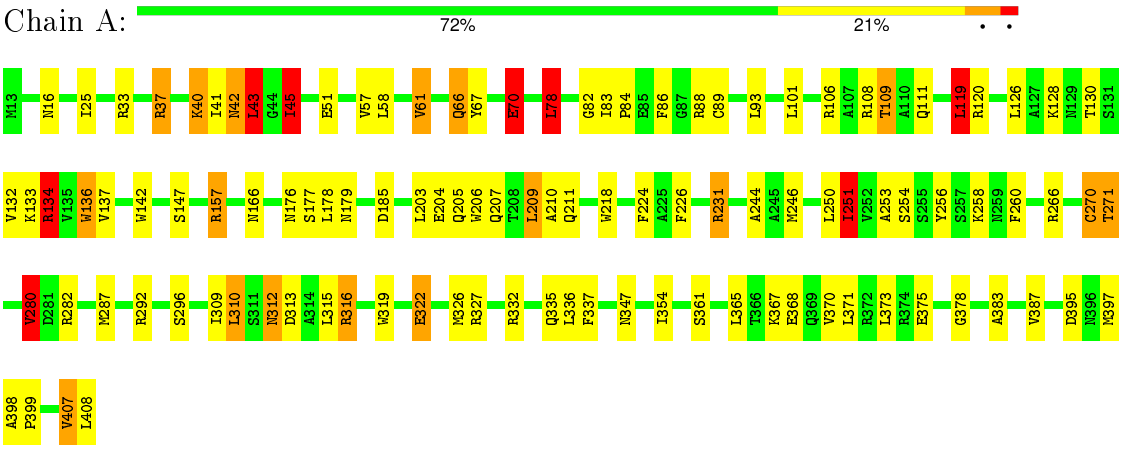
3 Residue-property plots (i)

These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of 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 (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: ASPARTATE AMINOTRANSFERASE

Chain A:



4 Data and refinement statistics (i)

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

Property	Value	Source
Space group	C 2 2 21	Depositor
Cell constants a, b, c, α, β, γ	157.80Å 85.50Å 78.70Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	(Not available) – 2.80	Depositor
% Data completeness (in resolution range)	(Not available) ((Not available)-2.80)	Depositor
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	X-PLOR	Depositor
R, R_{free}	0.200 , (Not available)	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	3226	wwPDB-VP
Average B, all atoms (Å^2)	18.0	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: MAE, PLP

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	0.86	1/3129 (0.0%)	1.61	49/4238 (1.2%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	2

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	251	ILE	CA-CB	5.19	1.66	1.54

All (49) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	266	ARG	NE-CZ-NH2	-15.46	112.57	120.30
1	A	332	ARG	NE-CZ-NH1	13.60	127.10	120.30
1	A	332	ARG	NE-CZ-NH2	-12.37	114.12	120.30
1	A	282	ARG	NE-CZ-NH1	10.30	125.45	120.30
1	A	88	ARG	NE-CZ-NH1	9.25	124.92	120.30
1	A	407	VAL	CG1-CB-CG2	-9.14	96.28	110.90
1	A	316	ARG	NE-CZ-NH1	9.02	124.81	120.30
1	A	282	ARG	NE-CZ-NH2	-7.95	116.33	120.30
1	A	142	TRP	CD1-CG-CD2	7.78	112.53	106.30
1	A	37	ARG	NE-CZ-NH1	7.73	124.17	120.30
1	A	42	ASN	CA-C-N	7.71	134.16	117.20
1	A	266	ARG	NE-CZ-NH1	7.65	124.12	120.30

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	136	TRP	CE2-CD2-CG	-7.39	101.39	107.30
1	A	218	TRP	CD1-CG-CD2	7.29	112.14	106.30
1	A	157	ARG	NE-CZ-NH1	7.04	123.82	120.30
1	A	319	TRP	CD1-CG-CD2	7.00	111.90	106.30
1	A	142	TRP	CE2-CD2-CG	-6.94	101.75	107.30
1	A	136	TRP	CD1-CG-CD2	6.66	111.63	106.30
1	A	231	ARG	NE-CZ-NH2	-6.58	117.01	120.30
1	A	147	SER	N-CA-CB	-6.51	100.73	110.50
1	A	120	ARG	NE-CZ-NH1	6.47	123.54	120.30
1	A	206	TRP	CE2-CD2-CG	-6.46	102.13	107.30
1	A	319	TRP	CE2-CD2-CG	-6.43	102.16	107.30
1	A	207	GLN	CA-CB-CG	6.42	127.52	113.40
1	A	282	ARG	CB-CG-CD	-6.35	95.08	111.60
1	A	218	TRP	CE2-CD2-CG	-6.20	102.34	107.30
1	A	57	VAL	CG1-CB-CG2	-6.07	101.18	110.90
1	A	316	ARG	NE-CZ-NH2	-6.05	117.27	120.30
1	A	42	ASN	CB-CG-ND2	5.90	130.86	116.70
1	A	322	GLU	CA-CB-CG	-5.76	100.72	113.40
1	A	142	TRP	CG-CD1-NE1	-5.73	104.37	110.10
1	A	142	TRP	CG-CD2-CE3	5.72	139.04	133.90
1	A	206	TRP	CD1-CG-CD2	5.68	110.85	106.30
1	A	270	CYS	CA-CB-SG	-5.68	103.78	114.00
1	A	231	ARG	NE-CZ-NH1	5.63	123.11	120.30
1	A	119	LEU	CA-CB-CG	5.62	128.22	115.30
1	A	45	ILE	CB-CA-C	-5.58	100.44	111.60
1	A	250	LEU	CA-CB-CG	5.58	128.12	115.30
1	A	67	TYR	CB-CG-CD1	-5.52	117.69	121.00
1	A	42	ASN	CA-C-O	-5.52	108.52	120.10
1	A	209	LEU	CA-CB-CG	5.46	127.85	115.30
1	A	326	MET	CG-SD-CE	5.34	108.75	100.20
1	A	43	LEU	N-CA-C	5.32	125.38	111.00
1	A	280	VAL	CA-CB-CG2	-5.29	102.96	110.90
1	A	108	ARG	NE-CZ-NH1	5.29	122.94	120.30
1	A	137	VAL	CG1-CB-CG2	-5.03	102.86	110.90
1	A	70	GLU	CA-CB-CG	5.02	124.45	113.40
1	A	78	LEU	CA-CB-CG	5.02	126.85	115.30
1	A	142	TRP	CB-CG-CD1	-5.01	120.49	127.00

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	134	ARG	Sidechain
1	A	327	ARG	Sidechain

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	3068	0	3016	50	0
2	A	15	0	6	0	0
3	A	8	0	2	0	0
4	A	135	0	0	3	0
All	All	3226	0	3024	50	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 8.

All (50) 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:109:THR:HB	1:A:271:THR:HG22	1.82	0.62
1:A:271:THR:HG23	4:A:592:HOH:O	1.99	0.60
1:A:109:THR:HG22	1:A:271:THR:HB	1.83	0.60
1:A:370:VAL:HG11	1:A:383:ALA:HA	1.84	0.60
1:A:78:LEU:HB2	4:A:631:HOH:O	2.01	0.60
1:A:226:PHE:CE1	1:A:258:LYS:HD3	2.39	0.56
1:A:292:ARG:HA	1:A:296:SER:HA	1.88	0.56
1:A:83:ILE:H	1:A:111:GLN:NE2	2.04	0.55
1:A:133:LYS:CE	1:A:134:ARG:HH12	2.20	0.54
1:A:133:LYS:HD3	1:A:134:ARG:HH12	1.73	0.54
1:A:337:PHE:HD1	1:A:397:MET:HE2	1.73	0.53
1:A:205:GLN:O	1:A:209:LEU:HB2	2.09	0.53
1:A:361:SER:HB3	1:A:387:VAL:HG23	1.91	0.52
1:A:58:LEU:HD22	1:A:322:GLU:HB3	1.90	0.52
1:A:210:ALA:HB1	1:A:246:MET:HG3	1.92	0.51
1:A:58:LEU:HB2	1:A:61:VAL:HG13	1.93	0.51
1:A:37:ARG:HH21	1:A:378:GLY:CA	2.24	0.51
1:A:361:SER:HB3	1:A:387:VAL:CG2	2.40	0.51

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:89:CYS:HB3	1:A:310:LEU:HD23	1.94	0.50
1:A:398:ALA:HB3	1:A:399:PRO:HD3	1.94	0.49
1:A:37:ARG:O	1:A:40:LYS:HG3	2.12	0.49
1:A:130:THR:HG22	1:A:132:VAL:H	1.77	0.49
1:A:335:GLN:HA	1:A:354:ILE:HD11	1.96	0.48
1:A:130:THR:CG2	1:A:132:VAL:HG23	2.44	0.47
1:A:136:TRP:CZ2	1:A:157:ARG:HD3	2.49	0.47
1:A:25:ILE:HG22	1:A:45:ILE:HG23	1.95	0.47
1:A:126:LEU:O	1:A:130:THR:HB	2.14	0.47
1:A:367:LYS:HE3	1:A:368:GLU:OE2	2.16	0.46
1:A:66:GLN:O	1:A:70:GLU:HG2	2.15	0.46
1:A:41:ILE:HG22	1:A:43:LEU:HD13	1.97	0.45
1:A:106:ARG:O	1:A:280:VAL:HG21	2.16	0.45
1:A:347:ASN:HD21	1:A:408:LEU:HB3	1.82	0.45
1:A:61:VAL:HA	1:A:309:ILE:HD11	1.98	0.45
1:A:251:ILE:CD1	1:A:270:CYS:SG	3.05	0.45
1:A:256:TYR:O	1:A:260:PHE:HB2	2.16	0.44
1:A:82:GLY:HA3	1:A:111:GLN:HB3	2.00	0.43
1:A:83:ILE:H	1:A:111:GLN:HE21	1.64	0.43
1:A:373:LEU:HG	1:A:407:VAL:HG21	2.01	0.43
1:A:83:ILE:HG13	1:A:111:GLN:HE22	1.84	0.43
1:A:119:LEU:HD13	1:A:253:ALA:CB	2.49	0.43
1:A:83:ILE:HA	1:A:84:PRO:HD3	1.92	0.42
1:A:83:ILE:O	1:A:86:PHE:HB3	2.19	0.42
1:A:37:ARG:HH21	1:A:378:GLY:HA2	1.84	0.42
1:A:101:LEU:HD11	1:A:244:ALA:HB1	2.02	0.41
1:A:133:LYS:CE	1:A:134:ARG:NH1	2.83	0.41
1:A:134:ARG:NH2	1:A:185:ASP:OD1	2.53	0.41
1:A:231:ARG:HD3	4:A:619:HOH:O	2.21	0.41
1:A:176:ASN:O	1:A:179:ASN:HB2	2.21	0.40
1:A:130:THR:HG22	1:A:132:VAL:HG23	2.02	0.40
1:A:312:ASN:HD22	1:A:313:ASP:N	2.19	0.40

There are no symmetry-related clashes.

5.3 Torsion angles (i)

5.3.1 Protein backbone (i)

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

of similar resolution.

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

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles
1	A	394/396 (100%)	378 (96%)	15 (4%)	1 (0%)	46 79

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	43	LEU

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	320/320 (100%)	284 (89%)	36 (11%)	7 22

All (36) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	16	ASN
1	A	33	ARG
1	A	40	LYS
1	A	42	ASN
1	A	45	ILE
1	A	51	GLU
1	A	61	VAL
1	A	66	GLN
1	A	70	GLU
1	A	78	LEU
1	A	93	LEU
1	A	109	THR
1	A	119	LEU
1	A	128	LYS
1	A	134	ARG
1	A	166	ASN

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
1	A	177	SER
1	A	178	LEU
1	A	203	LEU
1	A	204	GLU
1	A	211	GLN
1	A	224	PHE
1	A	251	ILE
1	A	254	SER
1	A	271	THR
1	A	280	VAL
1	A	287	MET
1	A	310	LEU
1	A	312	ASN
1	A	315	LEU
1	A	316	ARG
1	A	336	LEU
1	A	365	LEU
1	A	371	LEU
1	A	375	GLU
1	A	395	ASP

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	111	GLN
1	A	211	GLN
1	A	227	GLN
1	A	286	GLN
1	A	312	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 carbohydrates in this entry.

5.6 Ligand geometry (i)

2 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	PLP	A	409	1	15,15,16	2.40	5 (33%)	21,22,23	1.91	6 (28%)
3	MAE	A	410	-	1,7,7	0.80	0	0,8,8	0.00	-

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	PLP	A	409	1	-	0/6/6/8	0/1/1/1
3	MAE	A	410	-	-	0/0/5/5	0/0/0/0

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	409	PLP	C3-C2	-6.83	1.36	1.40
2	A	409	PLP	O4P-C5A	-3.34	1.30	1.44
2	A	409	PLP	C2A-C2	-2.83	1.44	1.50
2	A	409	PLP	O3-C3	-2.23	1.31	1.37
2	A	409	PLP	P-O2P	-2.05	1.47	1.54

All (6) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	A	409	PLP	C5-C6-N1	-3.73	117.38	123.86
2	A	409	PLP	O4P-P-O1P	-2.60	100.51	107.14

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	A	409	PLP	O3-C3-C2	2.30	121.66	117.66
2	A	409	PLP	C6-N1-C2	2.57	124.52	119.28
2	A	409	PLP	C6-C5-C4	3.24	120.90	118.15
2	A	409	PLP	O4P-C5A-C5	4.17	115.88	108.99

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

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 will therefore be empty.

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

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

6.3 Carbohydrates

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

6.4 Ligands

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

6.5 Other polymers

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