



Full wwPDB X-ray Structure Validation Report ⓘ

Feb 14, 2017 – 01:30 pm GMT

PDB ID : 1OJ9
Title : HUMAN MONOAMINE OXIDASE B IN COMPLEX WITH 1,4-DIPHENYL-2-BUTENE
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Deposited on : 2003-07-08
Resolution : 2.30 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 ⓘ symbol.

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

MolProbity	:	4.02b-467
Mogul	:	1.7.2 (RC1), CSD as538be (2017)
Xtriage (Phenix)	:	1.9-1692
EDS	:	trunk28620
Percentile statistics	:	20161228.v01 (using entries in the PDB archive December 28th 2016)
Refmac	:	5.8.0135
CCP4	:	6.5.0
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	recalc28949

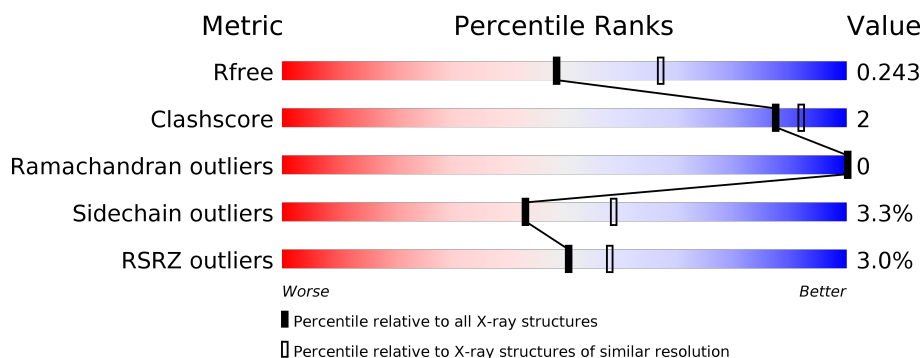
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.30 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))
R_{free}	100719	4130 (2.30-2.30)
Clashscore	112137	4751 (2.30-2.30)
Ramachandran outliers	110173	4705 (2.30-2.30)
Sidechain outliers	110143	4704 (2.30-2.30)
RSRZ outliers	101464	4156 (2.30-2.30)

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 $\leq 5\%$. 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.

Mol	Chain	Length	Quality of chain
1	A	520	<div> <div>3%</div> <div> <div></div> <div>88%</div> <div>7% • •</div> </div> </div>
1	B	520	<div> <div>2%</div> <div> <div></div> <div>86%</div> <div>8% • 5%</div> </div> </div>

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
3	1PB	A	1503	-	-	-	X
3	1PB	B	1498	-	-	-	X

2 Entry composition [i](#)

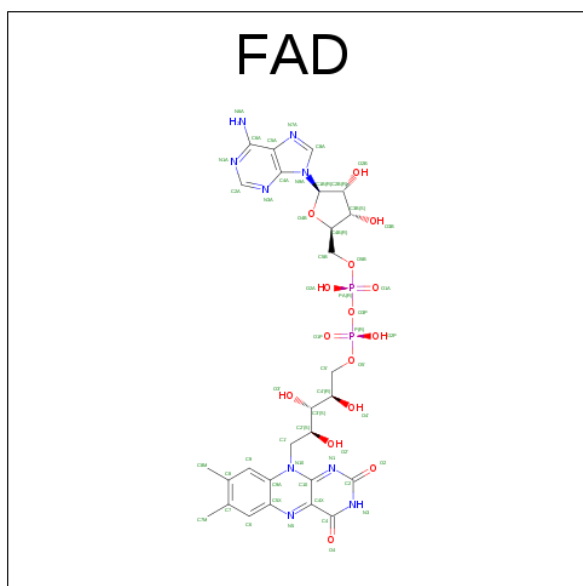
There are 4 unique types of molecules in this entry. The entry contains 8279 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 AMINE OXIDASE [FLAVIN-CONTAINING] B.

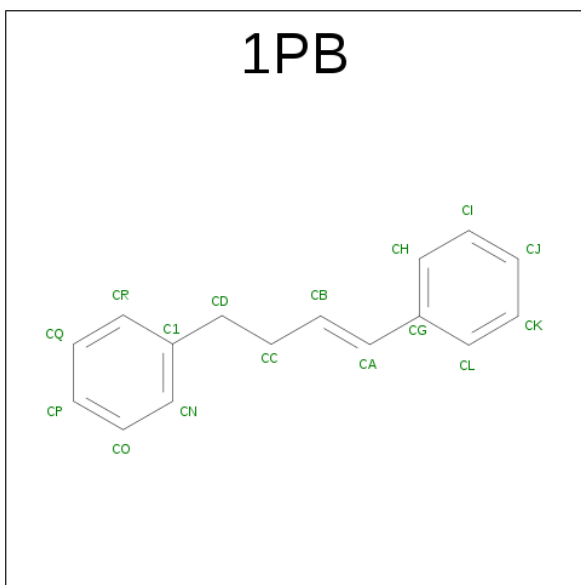
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	499	Total	C	N	O	S	0	0	0
			3971	2538	681	728	24			
1	B	494	Total	C	N	O	S	0	0	0
			3940	2519	676	721	24			

- Molecule 2 is FLAVIN-ADENINE DINUCLEOTIDE (three-letter code: FAD) (formula: $C_{27}H_{33}N_9O_{15}P_2$).



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

- Molecule 3 is 1,4-DIPHENYL-2-BUTENE (three-letter code: 1PB) (formula: $C_{16}H_{16}$).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	1	Total C 16 16	0	0
3	B	1	Total C 16 16	0	0

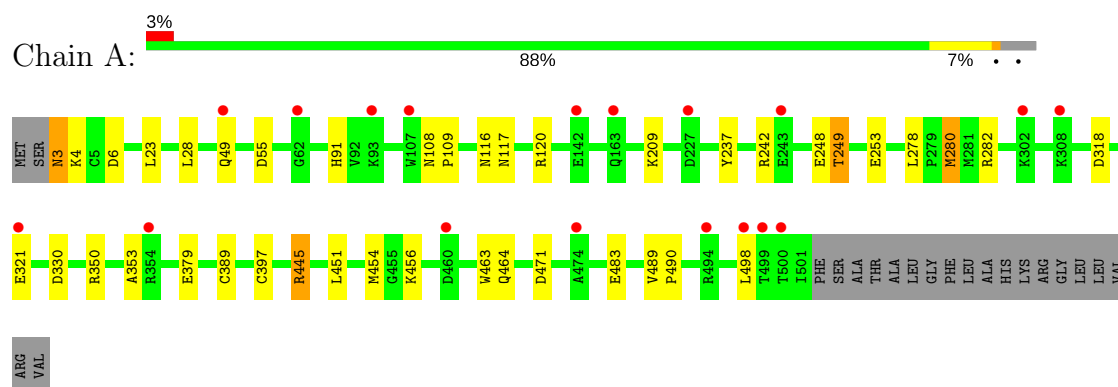
- Molecule 4 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	100	Total O 100 100	0	0
4	B	130	Total O 130 130	0	0

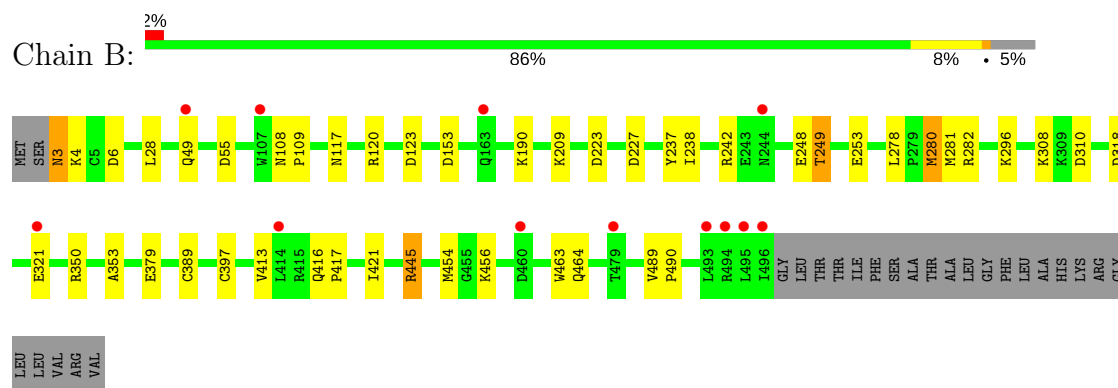
3 Residue-property plots

These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes 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.

• Molecule 1: AMINE OXIDASE [FLAVIN-CONTAINING] B



• Molecule 1: AMINE OXIDASE [FLAVIN-CONTAINING] B



4 Data and refinement statistics

Property	Value	Source
Space group	C 2 2 2	Depositor
Cell constants a, b, c, α , β , γ	132.10Å 224.02Å 86.83Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	40.00 – 2.30 69.03 – 2.30	Depositor EDS
% Data completeness (in resolution range)	90.6 (40.00-2.30) 90.2 (69.03-2.30)	Depositor EDS
R_{merge}	0.11	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.88 (at 2.29Å)	Xtriage
Refinement program	REFMAC	Depositor
R, R_{free}	0.212 , 0.253 0.206 , 0.243	Depositor DCC
R_{free} test set	1333 reflections (2.64%)	DCC
Wilson B-factor (Å ²)	19.8	Xtriage
Anisotropy	0.583	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 59.4	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	0.003 for 1/2*h-1/2*k,-3/2*h-1/2*k,-l 0.015 for 1/2*h+1/2*k,3/2*h-1/2*k,-l	Xtriage
F_o, F_c correlation	0.92	EDS
Total number of atoms	8279	wwPDB-VP
Average B, all atoms (Å ²)	43.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.56% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: 1PB, FAD

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	0.41	0/4068	0.64	4/5522 (0.1%)
1	B	0.41	0/4037	0.65	6/5479 (0.1%)
All	All	0.41	0/8105	0.64	10/11001 (0.1%)

There are no bond length outliers.

All (10) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	6	ASP	CB-CG-OD2	5.47	123.23	118.30
1	A	55	ASP	CB-CG-OD2	5.43	123.19	118.30
1	B	153	ASP	CB-CG-OD2	5.27	123.05	118.30
1	B	123	ASP	CB-CG-OD2	5.15	122.94	118.30
1	A	330	ASP	CB-CG-OD2	5.15	122.93	118.30
1	B	223	ASP	CB-CG-OD2	5.15	122.93	118.30
1	A	471	ASP	CB-CG-OD2	5.08	122.87	118.30
1	A	6	ASP	CB-CG-OD2	5.06	122.86	118.30
1	B	227	ASP	CB-CG-OD2	5.03	122.82	118.30
1	B	310	ASP	CB-CG-OD2	5.01	122.81	118.30

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	3971	0	3967	21	0
1	B	3940	0	3937	22	0
2	A	53	0	29	0	0
2	B	53	0	29	0	0
3	A	16	0	16	0	0
3	B	16	0	16	0	0
4	A	100	0	0	1	0
4	B	130	0	0	0	0
All	All	8279	0	7994	39	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 2.

All (39) 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:B:117:ASN:HD22	1:B:120:ARG:HH21	1.31	0.77
1:A:353:ALA:HB1	1:B:280:MET:HE1	1.71	0.71
1:A:117:ASN:HD22	1:A:120:ARG:HH21	1.37	0.71
1:A:280:MET:HE1	1:B:353:ALA:HB1	1.77	0.66
1:A:28:LEU:HD11	1:A:454:MET:HE1	1.88	0.55
1:A:3:ASN:HB3	1:A:4:LYS:HG2	1.89	0.55
1:B:3:ASN:HB3	1:B:4:LYS:HG2	1.90	0.54
1:A:389:CYS:HB2	1:B:280:MET:HG3	1.93	0.50
1:B:117:ASN:HD22	1:B:120:ARG:NH2	2.04	0.50
1:B:445:ARG:HD2	1:B:463:TRP:CZ2	2.48	0.48
1:A:91:HIS:HE1	4:A:2067:HOH:O	1.96	0.48
1:A:445:ARG:HD2	1:A:463:TRP:CZ2	2.50	0.47
1:B:278:LEU:HD13	1:B:282:ARG:HG2	1.98	0.46
1:A:117:ASN:HD22	1:A:120:ARG:NH2	2.09	0.45
1:B:28:LEU:HD11	1:B:454:MET:CE	2.46	0.45
1:A:28:LEU:HD11	1:A:454:MET:CE	2.46	0.45
1:A:278:LEU:HD13	1:A:282:ARG:HG2	1.98	0.45
1:A:116:ASN:HD21	1:A:483:GLU:HG2	1.82	0.45
1:B:308:LYS:HB2	1:B:308:LYS:HE2	1.85	0.45
1:A:445:ARG:HD2	1:A:463:TRP:CH2	2.52	0.44
1:B:28:LEU:HD21	1:B:456:LYS:HE3	1.99	0.44
1:A:28:LEU:HD21	1:A:456:LYS:HE3	2.00	0.44
1:B:281:MET:HB3	1:B:413:VAL:HG21	2.00	0.43
1:B:28:LEU:HD11	1:B:454:MET:HE1	2.00	0.43
1:A:108:ASN:HA	1:A:109:PRO:HD3	1.89	0.43
1:A:280:MET:HG3	1:B:389:CYS:HB2	2.01	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:249:THR:CG2	1:A:253:GLU:HB2	2.49	0.43
1:B:445:ARG:HD2	1:B:463:TRP:CH2	2.53	0.42
1:A:489:VAL:N	1:A:490:PRO:HD2	2.34	0.42
1:A:23:LEU:HD22	1:A:28:LEU:HD12	2.02	0.42
1:A:451:LEU:HA	1:A:454:MET:HE2	2.00	0.42
1:B:55:ASP:O	1:B:296:LYS:HE2	2.20	0.41
1:B:416:GLN:HA	1:B:417:PRO:HD3	1.93	0.41
1:A:237:TYR:HB3	1:A:248:GLU:HB3	2.02	0.41
1:B:237:TYR:HB3	1:B:248:GLU:HB3	2.02	0.41
1:B:489:VAL:N	1:B:490:PRO:HD2	2.35	0.41
1:B:108:ASN:HA	1:B:109:PRO:HD3	1.87	0.41
1:B:238:ILE:HG21	1:B:421:ILE:HD11	2.02	0.41
1:B:249:THR:CG2	1:B:253:GLU:HB2	2.52	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	497/520 (96%)	483 (97%)	14 (3%)	0	100	100
1	B	492/520 (95%)	481 (98%)	11 (2%)	0	100	100
All	All	989/1040 (95%)	964 (98%)	25 (2%)	0	100	100

There are no Ramachandran outliers to report.

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	427/444 (96%)	413 (97%)	14 (3%)	43	59
1	B	424/444 (96%)	410 (97%)	14 (3%)	43	59
All	All	851/888 (96%)	823 (97%)	28 (3%)	43	59

All (28) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	3	ASN
1	A	49	GLN
1	A	209	LYS
1	A	242	ARG
1	A	249	THR
1	A	280	MET
1	A	318	ASP
1	A	321	GLU
1	A	350	ARG
1	A	379	GLU
1	A	397	CYS
1	A	445	ARG
1	A	464	GLN
1	A	498	LEU
1	B	3	ASN
1	B	49	GLN
1	B	190	LYS
1	B	209	LYS
1	B	242	ARG
1	B	249	THR
1	B	280	MET
1	B	318	ASP
1	B	321	GLU
1	B	350	ARG
1	B	379	GLU
1	B	397	CYS
1	B	445	ARG
1	B	464	GLN

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (8) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	116	ASN
1	A	117	ASN
1	A	170	ASN
1	A	431	HIS
1	B	116	ASN
1	B	117	ASN
1	B	170	ASN
1	B	431	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 carbohydrates in this entry.

5.6 Ligand geometry [i](#)

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	FAD	A	1502	1	51,58,58	1.32	6 (11%)	54,89,89	2.08	6 (11%)
3	1PB	A	1503	-	17,17,17	1.11	2 (11%)	20,20,20	1.32	3 (15%)
2	FAD	B	1497	1	51,58,58	1.36	6 (11%)	54,89,89	2.02	7 (12%)
3	1PB	B	1498	-	17,17,17	1.13	2 (11%)	20,20,20	1.29	2 (10%)

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	FAD	A	1502	1	-	0/28/50/50	0/6/6/6
3	1PB	A	1503	-	-	0/7/7/7	0/2/2/2
2	FAD	B	1497	1	-	0/28/50/50	0/6/6/6
3	1PB	B	1498	-	-	0/7/7/7	0/2/2/2

All (16) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	B	1498	1PB	CD-CC	-2.90	1.39	1.53
3	A	1503	1PB	CD-CC	-2.87	1.39	1.53
2	B	1497	FAD	C2A-N1A	2.41	1.38	1.33
2	A	1502	FAD	C1'-N10	2.41	1.50	1.48
3	B	1498	1PB	CA-CB	2.43	1.39	1.31
3	A	1503	1PB	CA-CB	2.44	1.39	1.31
2	A	1502	FAD	C2A-N1A	2.55	1.38	1.33
2	B	1497	FAD	C1'-N10	2.64	1.51	1.48
2	A	1502	FAD	C4-N3	2.93	1.38	1.33
2	B	1497	FAD	C4-N3	3.16	1.38	1.33
2	B	1497	FAD	C4X-N5	3.54	1.38	1.33
2	A	1502	FAD	C2A-N3A	3.59	1.38	1.32
2	A	1502	FAD	C4X-N5	3.61	1.38	1.33
2	B	1497	FAD	C2A-N3A	3.96	1.38	1.32
2	B	1497	FAD	C10-N1	4.38	1.39	1.33
2	A	1502	FAD	C10-N1	4.38	1.39	1.33

All (18) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	1502	FAD	N3A-C2A-N1A	-10.46	119.75	128.86
2	B	1497	FAD	N3A-C2A-N1A	-10.41	119.80	128.86
2	A	1502	FAD	C4X-C10-N10	-5.93	116.40	120.52
2	B	1497	FAD	C4X-C10-N10	-5.21	116.90	120.52
2	A	1502	FAD	C4X-C4-N3	-3.13	119.03	123.48
3	A	1503	1PB	CC-CB-CA	-3.09	119.39	125.50
2	B	1497	FAD	C4X-C4-N3	-3.08	119.10	123.48
3	B	1498	1PB	CC-CB-CA	-3.06	119.45	125.50
2	A	1502	FAD	C9A-C5X-N5	-2.30	118.82	122.24
3	A	1503	1PB	CG-CA-CB	-2.16	121.08	127.00
2	B	1497	FAD	C9A-C5X-N5	-2.11	119.10	122.24

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	1497	FAD	C4X-N5-C5X	2.22	119.11	116.76
2	B	1497	FAD	C5X-C9A-N10	2.27	119.34	117.66
2	A	1502	FAD	C5X-C9A-N10	2.74	119.69	117.66
3	B	1498	1PB	CC-CD-C1	3.41	121.85	113.19
3	A	1503	1PB	CC-CD-C1	3.42	121.89	113.19
2	A	1502	FAD	C4-N3-C2	5.66	120.11	115.16
2	B	1497	FAD	C4-N3-C2	5.88	120.30	115.16

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

In the following table, the column labelled ‘#RSRZ > 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q < 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	499/520 (95%)	0.36	18 (3%) 43 50	30, 42, 58, 82	0
1	B	494/520 (95%)	0.44	12 (2%) 59 66	30, 41, 56, 73	0
All	All	993/1040 (95%)	0.40	30 (3%) 51 58	30, 42, 57, 82	0

All (30) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	107	TRP	4.6
1	B	496	ILE	3.3
1	B	494	ARG	3.3
1	B	479	THR	3.2
1	A	302	LYS	3.1
1	B	495	LEU	3.1
1	A	498	LEU	3.0
1	A	460	ASP	2.7
1	A	163	GLN	2.7
1	A	93	LYS	2.6
1	A	499	THR	2.6
1	A	354	ARG	2.6
1	B	49	GLN	2.6
1	A	500	THR	2.5
1	A	62	GLY	2.5
1	B	244	ASN	2.5
1	B	460	ASP	2.4
1	A	107	TRP	2.4
1	B	414	LEU	2.3
1	A	227	ASP	2.3
1	A	321	GLU	2.3
1	A	494	ARG	2.2
1	A	49	GLN	2.2
1	A	243	GLU	2.2

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Mol	Chain	Res	Type	RSRZ
1	A	308	LYS	2.1
1	B	163	GLN	2.1
1	A	474	ALA	2.1
1	B	321	GLU	2.1
1	A	142	GLU	2.0
1	B	493	LEU	2.0

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

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

6.3 Carbohydrates [i](#)

There are no carbohydrates in this entry.

6.4 Ligands [i](#)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. LLDF column lists the quality of electron density of the group with respect to its neighbouring residues in protein, DNA or RNA chains. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	LLDF	B-factors(\AA^2)	Q<0.9
3	1PB	B	1498	16/16	0.82	0.22	3.03	59,60,61,61	0
3	1PB	A	1503	16/16	0.83	0.25	2.65	59,60,61,61	0
2	FAD	A	1502	53/53	0.94	0.14	-0.15	36,38,45,46	0
2	FAD	B	1497	53/53	0.96	0.15	-0.34	36,38,45,46	0

6.5 Other polymers [i](#)

There are no such residues in this entry.