



# Full wwPDB X-ray Structure Validation Report ⓘ

Jun 23, 2024 – 02:08 AM EDT

PDB ID : 5EUN  
Title : The Crystal Structure of Human Kynurenine Aminotransferase II, PLP-bound form, at 1.83 Å  
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Deposited on : 2015-11-18  
Resolution : 1.82 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](mailto: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 ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

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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	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.37.1
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.37.1

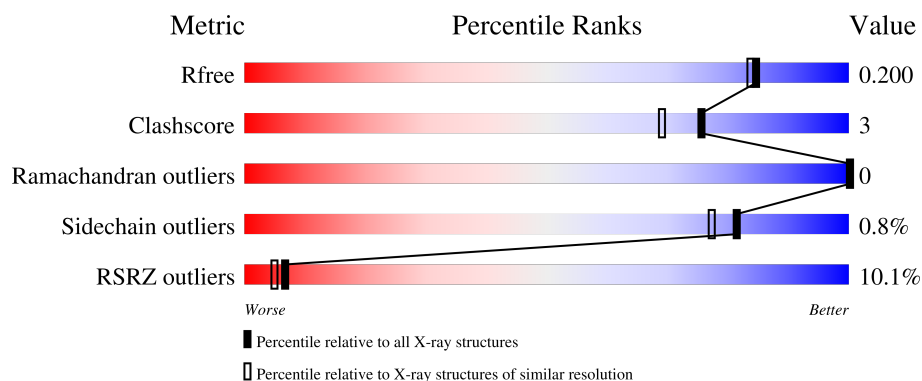
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.82 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))
$R_{free}$	130704	7484 (1.84-1.80)
Clashscore	141614	8401 (1.84-1.80)
Ramachandran outliers	138981	8290 (1.84-1.80)
Sidechain outliers	138945	8290 (1.84-1.80)
RSRZ outliers	127900	7371 (1.84-1.80)

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 of the lower bar indicate the fraction of residues that contain outliers for  $\geq 3$ , 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  $\leq 5\%$ . 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	425	<div> <div>10%</div> <div>93%</div> <div>6%</div> </div>

## 2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 7139 atoms, of which 3354 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 Kynurenine/alpha-aminoadipate aminotransferase, mitochondrial.

Mol	Chain	Residues	Atoms							ZeroOcc	AltConf	Trace
1	A	425	Total	C	H	N	O	P	S	0	0	0
			6701	2147	3354	560	621	1	18			

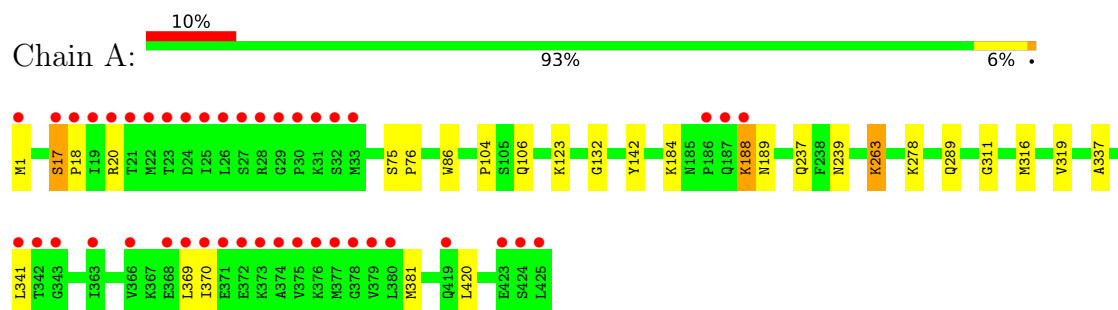
- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	438	Total	O	0	0
			438	438		

### 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 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: Kynurenine/alpha-aminoadipate aminotransferase, mitochondrial



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 43 21 2	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	102.45Å 102.45Å 86.24Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	40.46 – 1.82 40.46 – 1.83	Depositor EDS
% Data completeness (in resolution range)	95.9 (40.46-1.82) 95.1 (40.46-1.83)	Depositor EDS
$R_{merge}$	0.02	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.09 (at 1.83Å)	Xtriage
Refinement program	PHENIX (1.10.1_2155: 2015)	Depositor
R, $R_{free}$	0.173 , 0.199 0.174 , 0.200	Depositor DCC
$R_{free}$ test set	1942 reflections (4.90%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	17.4	Xtriage
Anisotropy	0.267	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.40 , 55.2	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.48$ , $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
$F_o, F_c$ correlation	0.95	EDS
Total number of atoms	7139	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	29.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.62% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical 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: LLP

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	0.28	0/3404	0.47	0/4620

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

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	17	SER	Peptide
1	A	188	LYS	Peptide

### 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	3347	3354	3357	21	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	A	438	0	0	0	0
All	All	3785	3354	3357	21	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 3.

All (21) 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:17:SER:HB3	1:A:18:PRO:CD	2.20	0.72
1:A:17:SER:HB3	1:A:18:PRO:HD3	1.81	0.63
1:A:142:TYR:CG	1:A:263:LLP:H2'3	2.44	0.53
1:A:142:TYR:HB2	1:A:263:LLP:H2'3	1.92	0.49
1:A:1:MET:HG3	1:A:106:GLN:OE1	2.13	0.49
1:A:316:MET:O	1:A:319:VAL:HG22	2.13	0.48
1:A:142:TYR:CB	1:A:263:LLP:H2'3	2.44	0.47
1:A:239:ASN:OD1	1:A:239:ASN:N	2.47	0.47
1:A:17:SER:HB2	1:A:289:GLN:HB3	1.98	0.46
1:A:369:LEU:HD11	1:A:420:LEU:HB3	1.97	0.46
1:A:86:TRP:CD1	1:A:86:TRP:C	2.90	0.46
1:A:18:PRO:HA	1:A:20:ARG:HE	1.81	0.45
1:A:237:GLN:HB3	1:A:239:ASN:OD1	2.18	0.43
1:A:370:ILE:HG21	1:A:381:MET:O	2.19	0.43
1:A:17:SER:CB	1:A:18:PRO:CD	2.95	0.43
1:A:132:GLY:O	1:A:189:ASN:ND2	2.49	0.42
1:A:337:ALA:HA	1:A:341:LEU:HD23	2.02	0.41
1:A:104:PRO:HB3	1:A:278:LYS:HD3	2.02	0.41
1:A:75:SER:HB2	1:A:76:PRO:CD	2.51	0.41
1:A:316:MET:HA	1:A:319:VAL:HG22	2.03	0.40
1:A:86:TRP:HH2	1:A:311:GLY:C	2.25	0.40

There are no symmetry-related clashes.

## 5.3 Torsion angles ⓘ

### 5.3.1 Protein backbone ⓘ

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	422/425 (99%)	402 (95%)	20 (5%)	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	369/369 (100%)	366 (99%)	3 (1%)	81	77

All (3) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	123	LYS
1	A	184	LYS
1	A	188	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

### 5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

1 non-standard protein/DNA/RNA residue is 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	$\# Z  > 2$
1	LLP	A	263	1	23,24,25	2.64	7 (30%)	25,32,34	1.26	2 (8%)

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
1	LLP	A	263	1	-	7/16/17/19	0/1/1/1

All (7) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	263	LLP	C4-C4'	8.24	1.62	1.46
1	A	263	LLP	C4'-NZ	5.01	1.44	1.27
1	A	263	LLP	C4-C5	-3.81	1.37	1.42
1	A	263	LLP	C2'-C2	3.54	1.56	1.50
1	A	263	LLP	C6-N1	3.05	1.40	1.34
1	A	263	LLP	C5'-C5	2.16	1.56	1.50
1	A	263	LLP	C3-C2	2.12	1.43	1.40

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	263	LLP	C4-C4'-NZ	-3.73	107.18	124.31
1	A	263	LLP	C5-C6-N1	-2.30	119.99	123.82

There are no chirality outliers.

All (7) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
1	A	263	LLP	C-CA-CB-CG
1	A	263	LLP	C4-C4'-NZ-CE
1	A	263	LLP	CA-CB-CG-CD
1	A	263	LLP	C3-C4-C4'-NZ
1	A	263	LLP	CD-CE-NZ-C4'
1	A	263	LLP	C5-C4-C4'-NZ
1	A	263	LLP	C5'-OP4-P-OP3

There are no ring outliers.

1 monomer is involved in 3 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
1	A	263	LLP	3	0

## 5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

## 5.6 Ligand geometry [i](#)

There are no ligands in this entry.

## 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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
1	A	424/425 (99%)	0.48	43 (10%) <b>7</b> <b>5</b>	10, 18, 75, 158	0

All (43) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	26	LEU	24.8
1	A	27	SER	18.9
1	A	23	THR	13.2
1	A	29	GLY	12.9
1	A	20	ARG	12.6
1	A	28	ARG	12.4
1	A	18	PRO	10.9
1	A	21	THR	9.3
1	A	25	ILE	9.3
1	A	19	ILE	9.1
1	A	342	THR	7.9
1	A	24	ASP	7.5
1	A	30	PRO	7.2
1	A	22	MET	6.4
1	A	31	LYS	5.9
1	A	32	SER	5.7
1	A	376	LYS	5.6
1	A	425	LEU	5.5
1	A	374	ALA	5.4
1	A	375	VAL	5.3
1	A	370	ILE	4.6
1	A	377	MET	4.5
1	A	379	VAL	4.5
1	A	378	GLY	4.3
1	A	380	LEU	4.3
1	A	188	LYS	4.3
1	A	17	SER	4.1

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Mol	Chain	Res	Type	RSRZ
1	A	372	GLU	4.0
1	A	33	MET	3.9
1	A	363	ILE	3.5
1	A	369	LEU	3.5
1	A	373	LYS	3.5
1	A	186	PRO	3.2
1	A	371	GLU	3.1
1	A	424	SER	3.0
1	A	368	GLU	2.8
1	A	341	LEU	2.5
1	A	423	GLU	2.3
1	A	1	MET	2.3
1	A	343	GLY	2.2
1	A	366	VAL	2.2
1	A	419	GLN	2.1
1	A	187	GLN	2.0

## 6.2 Non-standard residues in protein, DNA, RNA chains [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. The B-factors column lists the minimum, median, 95<sup>th</sup> 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	B-factors(Å <sup>2</sup> )	Q<0.9
1	LLP	A	263	24/25	0.85	0.22	16,35,52,54	0

## 6.3 Carbohydrates [i](#)

There are no monosaccharides in this entry.

## 6.4 Ligands [i](#)

There are no ligands in this entry.

## 6.5 Other polymers [i](#)

There are no such residues in this entry.