



# Full wwPDB X-ray Structure Validation Report ⓘ

Jan 27, 2024 – 10:20 AM EST

PDB ID : 1ASU  
Title : AVIAN SARCOMA VIRUS INTEGRASE CATALYTIC CORE DOMAIN  
CRYSTALLIZED FROM 2% PEG 400, 2M AMMONIUM SULFATE, HEPES  
PH 7.5  
Authors : Bujacz, G.; Jaskolski, M.; Alexandratos, J.; Wlodawer, A.  
Deposited on : 1995-08-25  
Resolution : 1.70 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)  
Xtrriage (Phenix) : **NOT EXECUTED**  
EDS : **NOT EXECUTED**  
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) : 2.36

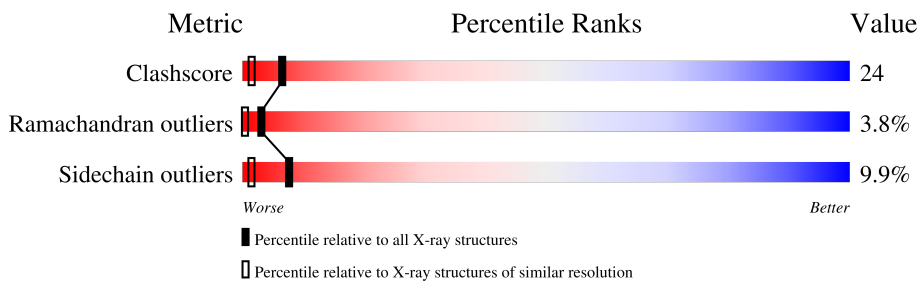
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.70 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	4695 (1.70-1.70)
Ramachandran outliers	138981	4610 (1.70-1.70)
Sidechain outliers	138945	4610 (1.70-1.70)

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  $\leq 5\%$ .

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	162	 72% 18% 7%

## 2 Entry composition i

There are 3 unique types of molecules in this entry. The entry contains 1454 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.

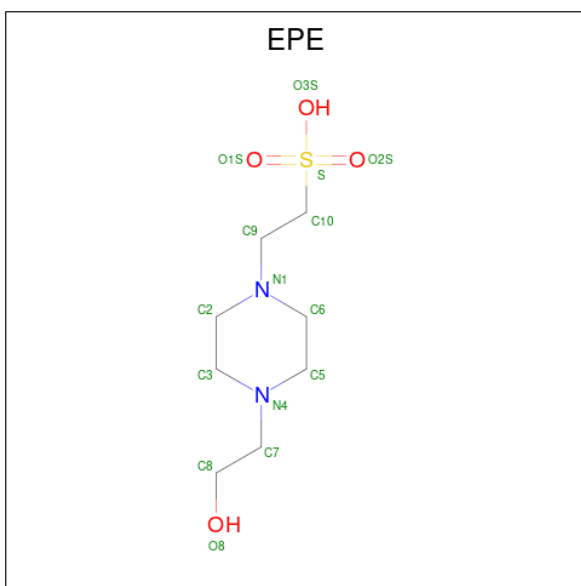
- Molecule 1 is a protein called AVIAN SARCOMA VIRUS INTEGRASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	162	1258	788	238	227	5	0	0	0

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	101	ALA	VAL	conflict	UNP P03354
A	166	LYS	ARG	conflict	UNP P03354

- Molecule 2 is 4-(2-HYDROXYETHYL)-1-PIPERAZINE ETHANESULFONIC ACID (three-letter code: EPE) (formula: C<sub>8</sub>H<sub>18</sub>N<sub>2</sub>O<sub>4</sub>S).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	S		
2	A	1	15	8	2	4	1	0	0

- Molecule 3 is water.

<b>Mol</b>	<b>Chain</b>	<b>Residues</b>	<b>Atoms</b>		<b>ZeroOcc</b>	<b>AltConf</b>
3	A	181	Total 181	O 181	0	0

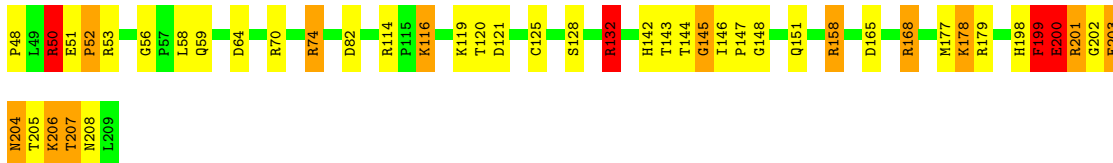
### 3 Residue-property plots

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: AVIAN SARCOMA VIRUS INTEGRASE

Chain A: 



## 4 Data and refinement statistics

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

Property	Value	Source
Space group	P 43 21 2	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	66.47Å 66.47Å 80.99Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	8.00 – 1.70	Depositor
% Data completeness (in resolution range)	88.7 (8.00-1.70)	Depositor
$R_{merge}$	0.09	Depositor
$R_{sym}$	(Not available)	Depositor
Refinement program	PROLSQ	Depositor
R, $R_{free}$	0.152 , 0.188	Depositor
Estimated twinning fraction	No twinning to report.	Xtrriage
Total number of atoms	1454	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	32.0	wwPDB-VP

## 5 Model quality [i](#)

### 5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: EPE

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	0.46	0/1285	1.54	15/1739 (0.9%)

There are no bond length outliers.

All (15) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	179	ARG	NE-CZ-NH2	-15.23	112.69	120.30
1	A	179	ARG	NE-CZ-NH1	10.76	125.68	120.30
1	A	168	ARG	CD-NE-CZ	8.55	135.57	123.60
1	A	132	ARG	NE-CZ-NH1	8.28	124.44	120.30
1	A	70	ARG	NE-CZ-NH2	-8.22	116.19	120.30
1	A	64	ASP	CB-CG-OD2	-7.68	111.39	118.30
1	A	74	ARG	CD-NE-CZ	-7.61	112.95	123.60
1	A	74	ARG	NE-CZ-NH1	-7.42	116.59	120.30
1	A	158	ARG	NE-CZ-NH1	6.69	123.64	120.30
1	A	114	ARG	NE-CZ-NH1	6.57	123.58	120.30
1	A	82	ASP	CB-CG-OD1	6.45	124.10	118.30
1	A	50	ARG	NE-CZ-NH2	6.00	123.30	120.30
1	A	121	ASP	CB-CG-OD1	5.96	123.67	118.30
1	A	114	ARG	NE-CZ-NH2	-5.60	117.50	120.30
1	A	144	THR	C-N-CA	5.05	132.90	122.30

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	1258	0	1275	61	0
2	A	15	0	18	0	0
3	A	181	0	0	12	0
All	All	1454	0	1293	61	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 24.

All (61) 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:52:PRO:HG2	1:A:56:GLY:O	1.74	0.86
1:A:132:ARG:HH11	1:A:132:ARG:HG3	1.41	0.86
1:A:132:ARG:HG3	1:A:132:ARG:NH1	1.93	0.84
1:A:51:GLU:HB2	1:A:52:PRO:HA	1.64	0.79
1:A:199:PHE:O	1:A:200:GLU:C	2.22	0.78
1:A:200:GLU:O	3:A:453:HOH:O	2.02	0.77
1:A:51:GLU:HB2	1:A:52:PRO:CA	2.14	0.76
1:A:125:CYS:SG	3:A:336:HOH:O	2.42	0.76
1:A:146:ILE:CG2	1:A:146:ILE:O	2.33	0.76
1:A:201:ARG:HG2	1:A:203:GLU:HB2	1.69	0.75
1:A:178:LYS:HE3	1:A:178:LYS:HA	1.68	0.75
1:A:199:PHE:O	1:A:201:ARG:HB2	1.87	0.74
1:A:165:ASP:HB3	3:A:390:HOH:O	1.87	0.74
1:A:205:THR:HG22	1:A:206:LYS:H	1.53	0.73
1:A:198:HIS:C	1:A:200:GLU:H	1.91	0.72
1:A:202:GLY:HA2	1:A:205:THR:OG1	1.91	0.71
1:A:132:ARG:HH11	1:A:132:ARG:CG	2.03	0.71
1:A:128:SER:O	1:A:132:ARG:HG2	1.91	0.70
1:A:52:PRO:HG3	1:A:58:LEU:HD23	1.76	0.68
1:A:52:PRO:HB3	1:A:58:LEU:HD23	1.79	0.64
1:A:198:HIS:C	1:A:200:GLU:N	2.52	0.63
1:A:178:LYS:HE3	3:A:368:HOH:O	2.00	0.62
1:A:201:ARG:HG2	1:A:203:GLU:CB	2.30	0.62
1:A:146:ILE:O	1:A:146:ILE:HG23	2.00	0.61
1:A:201:ARG:CG	1:A:203:GLU:HB2	2.30	0.60
1:A:202:GLY:O	1:A:204:ASN:N	2.35	0.60
1:A:201:ARG:HG2	1:A:203:GLU:H	1.67	0.60
1:A:205:THR:HG22	1:A:206:LYS:N	2.16	0.59

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:199:PHE:HE1	3:A:458:HOH:O	1.86	0.59
1:A:168:ARG:NH2	3:A:390:HOH:O	2.37	0.57
1:A:201:ARG:HG2	1:A:203:GLU:CA	2.33	0.57
1:A:51:GLU:H	1:A:51:GLU:CD	2.08	0.57
1:A:201:ARG:HG2	1:A:203:GLU:N	2.20	0.56
1:A:158:ARG:HG3	3:A:325:HOH:O	2.08	0.53
1:A:198:HIS:O	1:A:200:GLU:N	2.42	0.53
1:A:51:GLU:CB	1:A:52:PRO:HA	2.31	0.53
1:A:50:ARG:HD3	3:A:369:HOH:O	2.09	0.52
1:A:52:PRO:HG3	1:A:58:LEU:CD2	2.39	0.51
1:A:146:ILE:N	1:A:147:PRO:CD	2.74	0.51
1:A:52:PRO:CB	1:A:58:LEU:HA	2.43	0.49
1:A:146:ILE:N	1:A:147:PRO:HD3	2.27	0.49
1:A:177:MET:C	1:A:178:LYS:HD2	2.33	0.49
1:A:52:PRO:CG	1:A:58:LEU:HD23	2.40	0.49
1:A:52:PRO:CB	1:A:58:LEU:HD23	2.41	0.49
1:A:202:GLY:C	1:A:204:ASN:H	2.14	0.48
1:A:178:LYS:HD3	3:A:435:HOH:O	2.12	0.48
1:A:202:GLY:C	1:A:204:ASN:N	2.69	0.47
1:A:120:THR:OG1	1:A:142:HIS:HE1	1.97	0.46
1:A:165:ASP:CB	3:A:390:HOH:O	2.53	0.46
1:A:146:ILE:O	1:A:146:ILE:HG22	2.10	0.46
1:A:48:PRO:O	1:A:50:ARG:HD3	2.16	0.45
1:A:59:GLN:OE1	1:A:116:LYS:HE3	2.17	0.45
1:A:202:GLY:O	1:A:205:THR:N	2.50	0.44
1:A:132:ARG:NH2	3:A:399:HOH:O	2.52	0.43
1:A:146:ILE:C	1:A:148:GLY:H	2.21	0.43
1:A:52:PRO:CG	1:A:56:GLY:O	2.56	0.42
1:A:119:LYS:HG2	1:A:143:THR:HG23	2.02	0.42
1:A:146:ILE:HG23	3:A:451:HOH:O	2.18	0.41
1:A:74:ARG:HH11	1:A:74:ARG:HD2	1.39	0.41
1:A:119:LYS:HE2	1:A:145:GLY:O	2.20	0.41
1:A:199:PHE:CD1	1:A:201:ARG:CZ	3.04	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	160/162 (99%)	146 (91%)	8 (5%)	6 (4%)	<b>3</b> <b>0</b>

All (6) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	203	GLU
1	A	199	PHE
1	A	200	GLU
1	A	207	THR
1	A	52	PRO
1	A	145	GLY

### 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	131/131 (100%)	118 (90%)	13 (10%)	<b>8</b> <b>1</b>

All (13) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	50	ARG
1	A	53	ARG
1	A	116	LYS
1	A	132	ARG
1	A	151	GLN

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Mol	Chain	Res	Type
1	A	178	LYS
1	A	199	PHE
1	A	200	GLU
1	A	201	ARG
1	A	204	ASN
1	A	206	LYS
1	A	207	THR
1	A	208	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	142	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](#)

1 ligand 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
2	EPE	A	252	-	15,15,15	1.78	2 (13%)	18,20,20	1.99	5 (27%)

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	EPE	A	252	-	-	1/9/19/19	0/1/1/1

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	252	EPE	O3S-S	5.51	1.67	1.47
2	A	252	EPE	C10-S	3.06	1.81	1.77

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	252	EPE	O2S-S-C10	4.71	112.59	106.92
2	A	252	EPE	O3S-S-O1S	-3.49	102.75	111.27
2	A	252	EPE	C2-C3-N4	2.83	116.45	110.64
2	A	252	EPE	C6-N1-C2	2.33	114.06	108.83
2	A	252	EPE	O2S-S-O1S	2.24	121.71	113.95

There are no chirality outliers.

All (1) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	252	EPE	C10-C9-N1-C6

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

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.