



# wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 5, 2026 – 08:25 AM UTC

PDB ID : 1CF1 / pdb\_00001cf1  
Title : ARRESTIN FROM BOVINE ROD OUTER SEGMENTS  
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Deposited on : 1999-03-23  
Resolution : 2.80 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

<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 : 4-5-2 with Phenix2.0  
Xtrriage (Phenix) : 2.0  
EDS : 3.0  
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)  
CCP4 : 9.0.010 (Gargrove)  
Density-Fitness : 1.0.12  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.49

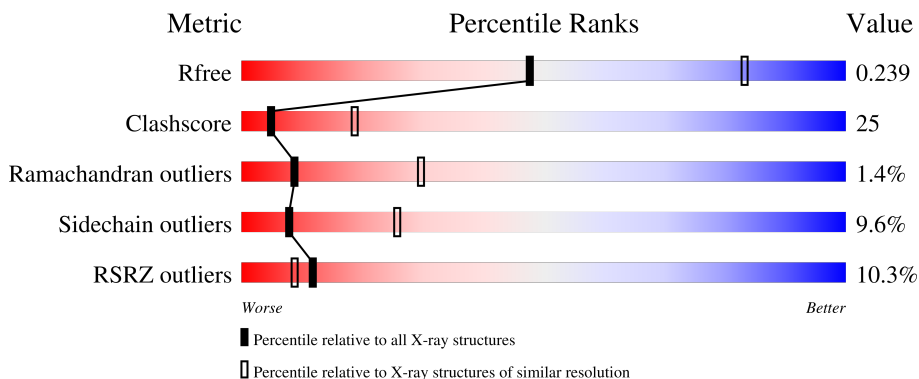
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.80 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))
$R_{free}$	180053	3866 (2.80-2.80)
Clashscore	190562	4276 (2.80-2.80)
Ramachandran outliers	187476	4196 (2.80-2.80)
Sidechain outliers	187428	4198 (2.80-2.80)
RSRZ outliers	180081	3869 (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 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	404	
1	B	404	
1	C	404	
1	D	404	

## 2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 11700 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 PROTEIN (ARRESTIN).

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	373	Total 2946	C 1885	N 496	O 556	S 9	0	0	0
1	B	360	Total 2839	C 1818	N 482	O 531	S 8	0	0	0
1	C	380	Total 2983	C 1908	N 503	O 563	S 9	0	0	0
1	D	368	Total 2907	C 1860	N 491	O 547	S 9	0	0	0

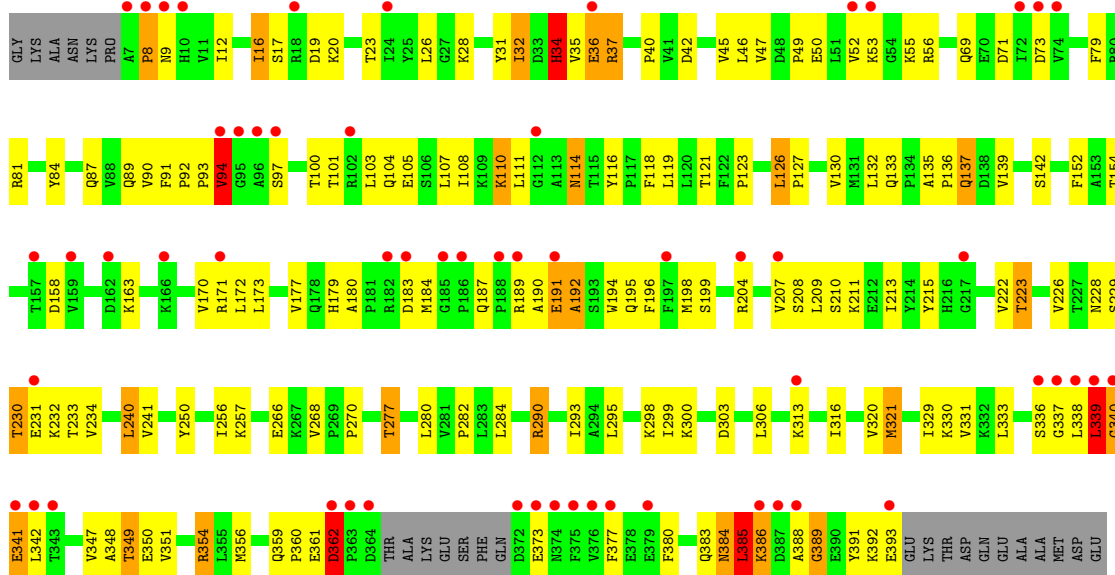
- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	7	Total 7	O 7	0	0
2	B	10	Total 10	O 10	0	0
2	C	1	Total 1	O 1	0	0
2	D	7	Total 7	O 7	0	0

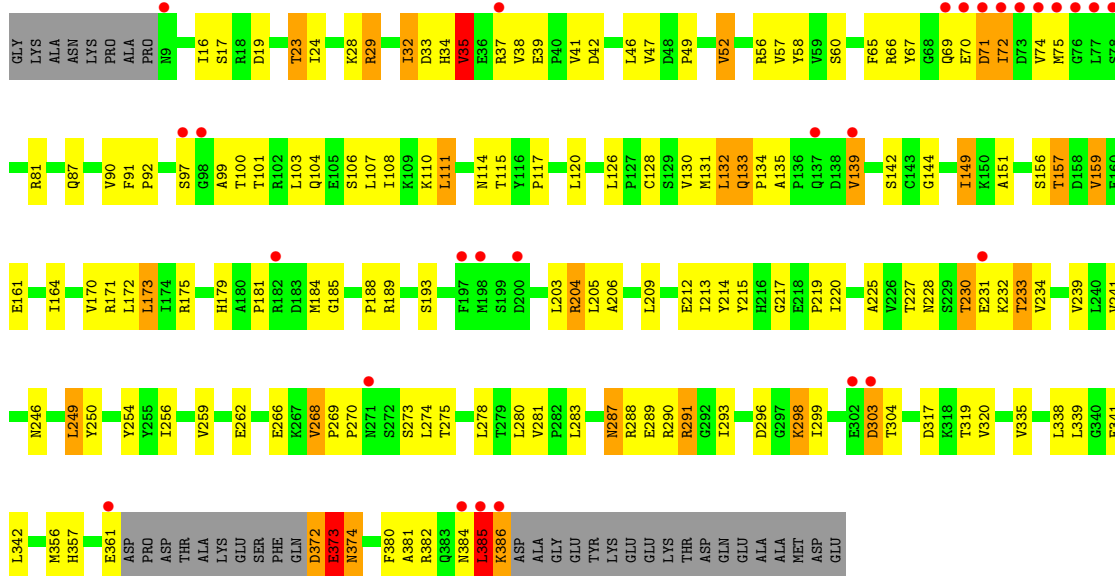




• Molecule 1: PROTEIN (ARRESTIN)



• Molecule 1: PROTEIN (ARRESTIN)



## 4 Data and refinement statistics

Property	Value	Source
Space group	C 2 2 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	168.85Å 193.19Å 191.12Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	45.00 – 2.80 45.00 – 2.81	Depositor EDS
% Data completeness (in resolution range)	91.5 (45.00-2.80) 91.6 (45.00-2.81)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	0.05	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.29 (at 2.81Å)	Xtrriage
Refinement program	CNS	Depositor
R, $R_{free}$	0.233 , 0.244 0.229 , 0.239	Depositor DCC
$R_{free}$ test set	1762 reflections (2.52%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	60.7	Xtrriage
Anisotropy	0.182	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.31 , 46.2	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.50$ , $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.92	EDS
Total number of atoms	11700	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	59.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.52% 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 [i](#)

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

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	0/3004	0.99	9/4069 (0.2%)
1	B	0.51	0/2895	1.08	20/3923 (0.5%)
1	C	0.43	0/3042	1.03	13/4123 (0.3%)
1	D	0.57	2/2964 (0.1%)	1.09	25/4016 (0.6%)
All	All	0.49	2/11905 (0.0%)	1.05	67/16131 (0.4%)

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	D	384	ASN	CA-C	8.65	1.64	1.52
1	D	385	LEU	N-CA	6.00	1.53	1.46

The worst 5 of 67 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	34	HIS	N-CA-C	-10.55	94.90	110.52
1	A	34	HIS	N-CA-C	-9.44	95.32	110.32
1	B	383	GLN	OE1-CD-NE2	-9.33	113.27	122.60
1	C	342	LEU	N-CA-C	-9.03	100.93	112.93
1	D	385	LEU	CA-C-N	-8.82	105.82	121.70

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	2946	0	3011	158	0
1	B	2839	0	2904	141	0
1	C	2983	0	3032	170	0
1	D	2907	0	2977	145	0
2	A	7	0	0	0	0
2	B	10	0	0	1	0
2	C	1	0	0	0	0
2	D	7	0	0	0	0
All	All	11700	0	11924	598	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 25.

The worst 5 of 598 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:111:LEU:HB3	1:B:115:THR:HG21	1.36	1.07
1:D:111:LEU:HB3	1:D:115:THR:HG21	1.34	1.06
1:D:385:LEU:O	1:D:386:LYS:C	1.99	1.04
1:B:131:MET:HE1	1:B:298:LYS:HD2	1.46	0.97
1:A:191:GLU:HG3	1:A:208:SER:HB3	1.47	0.96

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	369/404 (91%)	340 (92%)	25 (7%)	4 (1%)	<b>11</b> 36
1	B	354/404 (88%)	337 (95%)	15 (4%)	2 (1%)	21 51
1	C	376/404 (93%)	340 (90%)	27 (7%)	9 (2%)	<b>4</b> <b>17</b>
1	D	364/404 (90%)	340 (93%)	19 (5%)	5 (1%)	<b>9</b> 30

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
All	All	1463/1616 (90%)	1357 (93%)	86 (6%)	20 (1%)	9	30

5 of 20 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	374	ASN
1	D	385	LEU
1	C	339	LEU
1	C	389	GLY
1	A	110	LYS

### 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	333/358 (93%)	298 (90%)	35 (10%)	6	22
1	B	321/358 (90%)	293 (91%)	28 (9%)	9	30
1	C	334/358 (93%)	302 (90%)	32 (10%)	8	26
1	D	330/358 (92%)	298 (90%)	32 (10%)	8	25
All	All	1318/1432 (92%)	1191 (90%)	127 (10%)	8	26

5 of 127 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	246	ASN
1	D	156	SER
1	C	126	LEU
1	D	149	ILE
1	D	246	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 43 such sidechains are listed below:

Mol	Chain	Res	Type
1	C	195	GLN
1	D	9	ASN
1	C	228	ASN
1	C	357	HIS
1	D	187	GLN

### 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 oligosaccharides 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 [i](#)

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

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	373/404 (92%)	0.56	41 (10%) 10 8	22, 56, 113, 134	0
1	B	360/404 (89%)	0.32	25 (6%) 23 16	28, 47, 85, 141	0
1	C	380/404 (94%)	0.87	58 (15%) 5 4	29, 63, 119, 148	0
1	D	368/404 (91%)	0.30	28 (7%) 20 14	28, 46, 95, 134	0
All	All	1481/1616 (91%)	0.52	152 (10%) 12 9	22, 52, 109, 148	0

The worst 5 of 152 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	372	ASP	10.4
1	C	364	ASP	9.1
1	D	72	ILE	7.3
1	C	338	LEU	7.1
1	C	372	ASP	6.7

### 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 oligosaccharides 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.