



# Full wwPDB X-ray Structure Validation Report ⓘ

Nov 25, 2024 – 05:57 PM EST

PDB ID : 3DNH  
Title : The crystal structure of the protein Atu2129 (unknown function) from *Agrobacterium tumefaciens* str. C58  
Authors : Tan, K.; Xu, X.; Zheng, H.; Savchenko, A.; Edwards, A.; Joachimiak, A.; Midwest Center for Structural Genomics (MCSG)  
Deposited on : 2008-07-02  
Resolution : 1.94 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	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	1.21
EDS	:	3.0
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.004 (Gargrove)
Density-Fitness	:	1.0.11
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.40

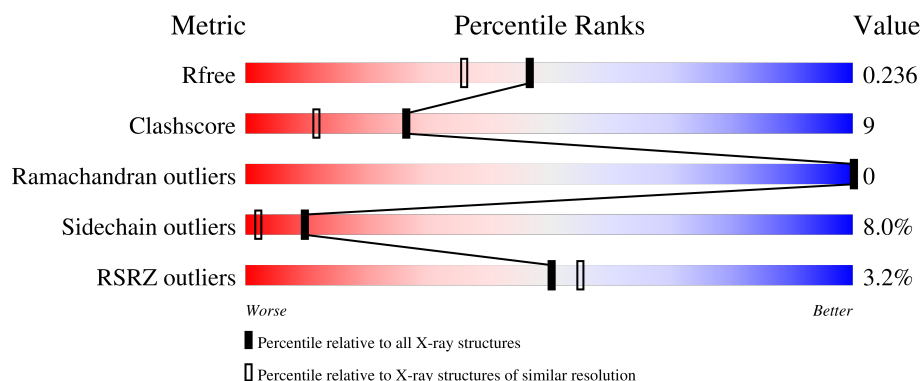
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.94 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))
$R_{free}$	164625	1306 (1.94-1.94)
Clashscore	180529	1400 (1.94-1.94)
Ramachandran outliers	177936	1387 (1.94-1.94)
Sidechain outliers	177891	1387 (1.94-1.94)
RSRZ outliers	164620	1306 (1.94-1.94)

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  $\leq 5\%$ .

Mol	Chain	Length	Quality of chain
1	A	258	
1	B	258	

## 2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 3843 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 uncharacterized protein Atu2129.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	234	Total	C	N	O	Se	0	2	0
			1791	1138	316	335	2			
1	B	233	Total	C	N	O	Se	0	0	0
			1763	1116	314	331	2			

There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-1	GLY	-	expression tag	UNP A9CI98
A	0	HIS	-	expression tag	UNP A9CI98
A	255	GLY	-	expression tag	UNP A9CI98
A	256	SER	-	expression tag	UNP A9CI98
B	-1	GLY	-	expression tag	UNP A9CI98
B	0	HIS	-	expression tag	UNP A9CI98
B	255	GLY	-	expression tag	UNP A9CI98
B	256	SER	-	expression tag	UNP A9CI98

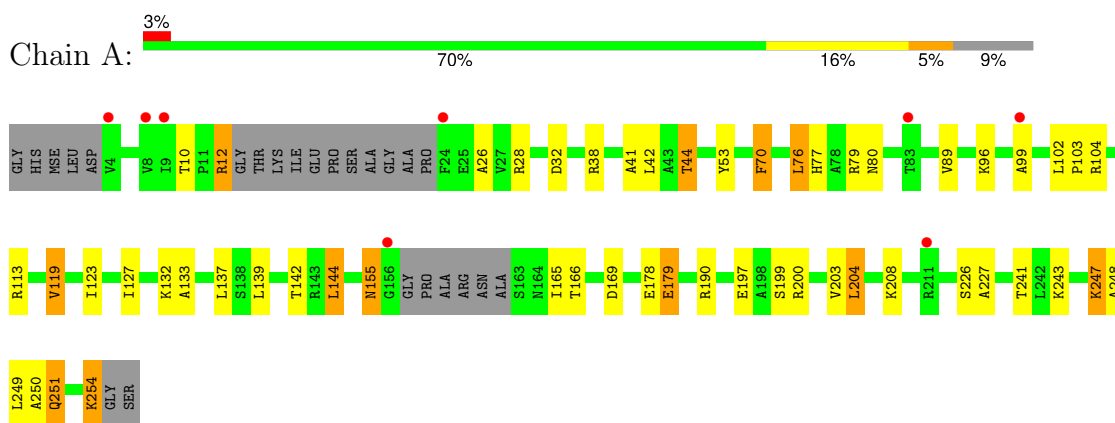
- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	155	Total	O	0	0
			155	155		
2	B	134	Total	O	0	0
			134	134		

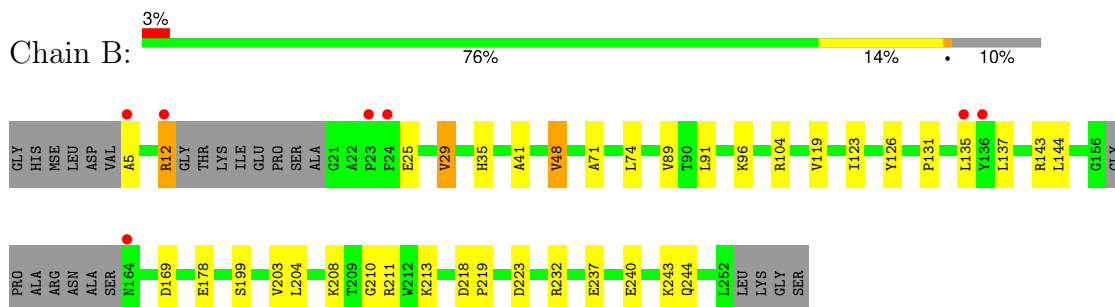
### 3 Residue-property plots [i](#)

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. 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.

- Molecule 1: uncharacterized protein Atu2129



- Molecule 1: uncharacterized protein Atu2129



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	53.65Å 66.83Å 69.97Å 90.00° 108.19° 90.00°	Depositor
Resolution (Å)	29.76 – 1.94 29.76 – 1.94	Depositor EDS
% Data completeness (in resolution range)	99.3 (29.76-1.94) 99.3 (29.76-1.94)	Depositor EDS
$R_{merge}$	0.08	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.02 (at 1.95Å)	Xtriage
Refinement program	REFMAC 5.2.0019	Depositor
R, $R_{free}$	0.187 , 0.238 0.186 , 0.236	Depositor DCC
$R_{free}$ test set	1726 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	33.2	Xtriage
Anisotropy	0.276	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.31 , 40.0	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.50$ , $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
$F_o, F_c$ correlation	0.95	EDS
Total number of atoms	3843	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	41.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 7.49% 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	0.78	0/1827	0.84	1/2483 (0.0%)
1	B	0.74	2/1793 (0.1%)	0.79	0/2437
All	All	0.76	2/3620 (0.1%)	0.82	1/4920 (0.0%)

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	237	GLU	CD-OE2	5.15	1.31	1.25
1	B	5	ALA	N-CA	5.01	1.56	1.46

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	204	LEU	CA-CB-CG	5.18	127.21	115.30

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	1791	0	1827	46	0
1	B	1763	0	1792	23	0
2	A	155	0	0	6	0
2	B	134	0	0	3	0
All	All	3843	0	3619	66	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 9.

All (66) 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:44:THR:CG2	1:A:80:ASN:HD22	1.92	0.83
1:A:10:THR:OG1	1:B:48:VAL:HG13	1.80	0.82
1:A:254:LYS:HA	1:A:254:LYS:HE3	1.60	0.81
1:A:137:LEU:O	1:A:142:THR:HG21	1.86	0.74
1:A:70[B]:PHE:CE1	1:A:144:LEU:HD22	2.25	0.72
1:B:35:HIS:HD2	1:B:223:ASP:OD2	1.71	0.72
1:A:44:THR:HG23	1:A:80:ASN:HD22	1.55	0.70
1:A:203:VAL:HG21	2:A:349:HOH:O	1.91	0.70
1:A:70[B]:PHE:CZ	1:A:144:LEU:HD22	2.28	0.68
1:A:166:THR:HG23	1:A:169:ASP:H	1.57	0.68
1:A:179:GLU:HG2	1:A:241:THR:HA	1.78	0.64
1:A:142:THR:HG22	2:A:332:HOH:O	1.99	0.62
1:A:250:ALA:O	1:A:254:LYS:HD2	2.00	0.61
1:A:70[B]:PHE:HZ	1:A:123:ILE:HD13	1.66	0.61
1:A:76:LEU:HD13	1:B:12:ARG:HG2	1.83	0.60
1:A:96:LYS:CB	2:A:342:HOH:O	2.49	0.60
1:A:70[B]:PHE:CZ	1:A:123:ILE:HD13	2.37	0.59
1:A:123:ILE:HD12	1:A:137:LEU:HD13	1.86	0.57
1:B:240:GLU:H	1:B:244:GLN:NE2	2.02	0.57
1:B:178:GLU:H	1:B:178:GLU:CD	2.07	0.57
1:A:70[B]:PHE:CZ	1:A:144:LEU:CD2	2.88	0.56
1:A:26:ALA:HB1	1:A:165:ILE:HD11	1.89	0.55
1:A:103:PRO:HA	1:A:155:ASN:O	2.09	0.53
1:A:28:ARG:NH1	1:A:32[B]:ASP:OD2	2.42	0.52
1:A:102:LEU:O	1:A:104:ARG:HD3	2.09	0.52
1:A:178:GLU:CD	1:A:178:GLU:H	2.12	0.52
1:A:243:LYS:O	1:A:247:LYS:HG2	2.09	0.52
1:B:210:GLY:HA3	2:B:355:HOH:O	2.10	0.52
1:A:79:ARG:HD3	2:A:303:HOH:O	2.10	0.51
1:A:70[B]:PHE:HZ	1:A:123:ILE:CD1	2.25	0.50
1:A:44:THR:HG23	1:A:80:ASN:ND2	2.26	0.50
1:B:91:LEU:HD12	1:B:91:LEU:N	2.28	0.49
1:B:131:PRO:HG3	1:B:213:LYS:NZ	2.27	0.49
1:A:44:THR:HG22	1:A:53:TYR:HB3	1.95	0.49
1:A:127:ILE:HD13	1:A:133:ALA:HB3	1.95	0.48
1:A:254:LYS:HA	1:A:254:LYS:CE	2.35	0.48
1:A:70[B]:PHE:CZ	1:A:123:ILE:CD1	2.97	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:44:THR:HG23	1:A:80:ASN:CB	2.45	0.47
1:A:166:THR:HG22	1:A:169:ASP:CG	2.34	0.47
1:B:41:ALA:O	1:B:89:VAL:HA	2.15	0.46
1:B:119:VAL:O	1:B:123:ILE:HG12	2.14	0.46
1:A:119:VAL:HB	1:A:144:LEU:HD23	1.97	0.46
1:A:139:LEU:O	1:A:142:THR:HG23	2.16	0.46
1:B:123:ILE:HD11	1:B:144:LEU:HD11	1.98	0.45
1:B:126:TYR:CD2	1:B:137:LEU:HD11	2.51	0.45
1:B:240:GLU:H	1:B:244:GLN:HE21	1.64	0.44
1:B:35:HIS:HE1	2:B:364:HOH:O	1.99	0.44
1:A:44:THR:HG21	1:A:77:HIS:HA	2.00	0.44
1:B:25:GLU:O	1:B:29:VAL:HG12	2.18	0.43
1:B:71:ALA:O	1:B:143:ARG:HB2	2.19	0.43
1:B:223:ASP:OD1	1:B:232:ARG:HD2	2.19	0.43
1:A:123:ILE:CD1	1:A:137:LEU:HD13	2.48	0.42
1:A:200:ARG:O	1:A:203:VAL:HG22	2.19	0.42
1:A:12:ARG:HB2	2:A:368:HOH:O	2.19	0.42
1:A:199:SER:O	1:A:203:VAL:HG13	2.19	0.41
1:A:248:ALA:O	1:A:251:GLN:NE2	2.53	0.41
1:A:38:ARG:NH1	1:A:226:SER:O	2.44	0.41
1:B:123:ILE:HD12	1:B:137:LEU:HB3	2.03	0.41
1:B:218:ASP:HB2	1:B:219:PRO:CD	2.51	0.41
1:A:41:ALA:HB1	1:B:41:ALA:HB1	2.03	0.41
1:A:41:ALA:O	1:A:89:VAL:HA	2.20	0.41
1:A:99:ALA:O	1:A:104:ARG:HD2	2.21	0.41
1:A:227:ALA:HA	2:A:288:HOH:O	2.20	0.40
1:B:243:LYS:HA	1:B:243:LYS:HD3	1.87	0.40
1:B:169:ASP:OD1	2:B:381:HOH:O	2.22	0.40
1:B:199:SER:O	1:B:203:VAL:HG13	2.22	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	230/258 (89%)	224 (97%)	6 (3%)	0	100	100
1	B	227/258 (88%)	222 (98%)	5 (2%)	0	100	100
All	All	457/516 (89%)	446 (98%)	11 (2%)	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	184/196 (94%)	164 (89%)	20 (11%)	5	1
1	B	179/196 (91%)	169 (94%)	10 (6%)	17	6
All	All	363/392 (93%)	333 (92%)	30 (8%)	10	2

All (30) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	12	ARG
1	A	42	LEU
1	A	44	THR
1	A	70[A]	PHE
1	A	70[B]	PHE
1	A	76	LEU
1	A	113	ARG
1	A	119	VAL
1	A	132	LYS
1	A	144	LEU
1	A	155	ASN
1	A	179	GLU
1	A	190	ARG
1	A	197	GLU
1	A	204	LEU
1	A	208	LYS
1	A	247	LYS
1	A	249	LEU

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Mol	Chain	Res	Type
1	A	251	GLN
1	A	254	LYS
1	B	12	ARG
1	B	29	VAL
1	B	48	VAL
1	B	74	LEU
1	B	96	LYS
1	B	104	ARG
1	B	135	LEU
1	B	204	LEU
1	B	208	LYS
1	B	211	ARG

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

Mol	Chain	Res	Type
1	A	251	GLN
1	B	35	HIS
1	B	153	GLN
1	B	155	ASN
1	B	244	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](#)

**Warning:** The R factor obtained from EDS is 0.2479, which does not match the depositor's R factor of 0.1867. Please interpret the results in this section carefully.

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	232/258 (89%)	0.59	8 (3%) 48 53	21, 40, 50, 61	2 (0%)
1	B	231/258 (89%)	0.59	7 (3%) 52 58	34, 40, 52, 58	0
All	All	463/516 (89%)	0.59	15 (3%) 50 55	21, 40, 51, 61	2 (0%)

All (15) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	24	PHE	3.9
1	A	4	VAL	3.6
1	A	156	GLY	3.1
1	B	164	ASN	2.9
1	A	24	PHE	2.8
1	B	5	ALA	2.8
1	A	211	ARG	2.5
1	B	136	TYR	2.5
1	A	99	ALA	2.5
1	A	8	VAL	2.4
1	A	83	THR	2.4
1	B	135	LEU	2.3
1	A	9	ILE	2.3
1	B	12	ARG	2.2
1	B	23	PRO	2.2

### 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 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.