



# Full wwPDB X-ray Structure Validation Report ⓘ

Jun 13, 2020 – 10:04 pm BST

PDB ID : 5VJ4  
Title : Crystal structure of a putative surface protein encoded by BTA121  
Authors : Luo, Z.; Asojo, O.  
Deposited on : 2017-04-18  
Resolution : 2.80 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.

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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 : 2.11  
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) : 2.11

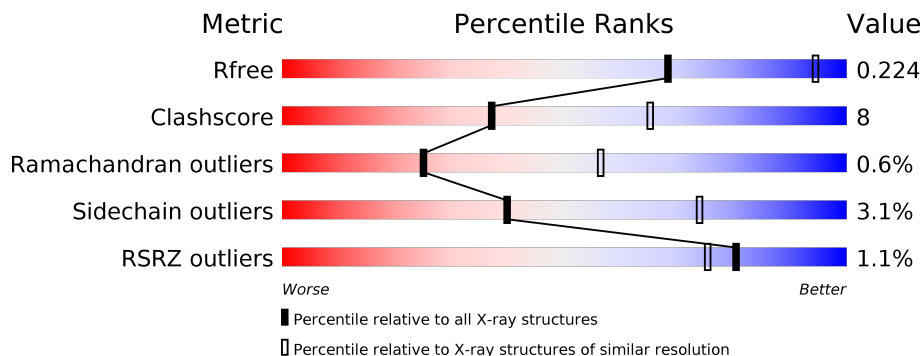
# 1 Overall quality at a glance

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))
$R_{free}$	130704	3140 (2.80-2.80)
Clashscore	141614	3569 (2.80-2.80)
Ramachandran outliers	138981	3498 (2.80-2.80)
Sidechain outliers	138945	3500 (2.80-2.80)
RSRZ outliers	127900	3078 (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 on 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	375	
1	B	375	

## 2 Entry composition [i](#)

There are 3 unique types of molecules in this entry. The entry contains 4396 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.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
			Total	C	N	O	S	Se			
1	A	275	Total 2183	C 1400	N 377	O 401	S 1	Se 4	0	0	0
1	B	273	Total 2141	C 1365	N 366	O 405	S 1	Se 4	0	0	0

- Molecule 2 is SULFATE ION (three-letter code: SO4) (formula: O<sub>4</sub>S).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
			Total	O	S		
2	A	1	Total 5	O 4	S 1	0	0
2	A	1	Total 5	O 4	S 1	0	0
2	A	1	Total 5	O 4	S 1	0	0
2	A	1	Total 5	O 4	S 1	0	0

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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	A	1	Total	O	S	0	0
			5	4	1		
2	A	1	Total	O	S	0	0
			5	4	1		
2	B	1	Total	O	S	0	0
			5	4	1		
2	B	1	Total	O	S	0	0
			5	4	1		
2	B	1	Total	O	S	0	0
			5	4	1		
2	B	1	Total	O	S	0	0
			5	4	1		
2	B	1	Total	O	S	0	0
			5	4	1		

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	4	Total	O	0	0
			4	4		
3	B	3	Total	O	0	0
			3	3		



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 61	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	102.06Å 102.06Å 183.21Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	39.80 – 2.80 39.80 – 2.80	Depositor EDS
% Data completeness (in resolution range)	99.8 (39.80-2.80) 99.9 (39.80-2.80)	Depositor EDS
$R_{merge}$	0.08	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.08 (at 2.81Å)	Xtrriage
Refinement program	REFMAC 5.8.0135	Depositor
R, $R_{free}$	0.196 , 0.224 0.196 , 0.224	Depositor DCC
$R_{free}$ test set	1293 reflections (4.87%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	74.9	Xtrriage
Anisotropy	0.391	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.29 , 46.8	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.50$ , $\langle L^2 \rangle = 0.34$	Xtrriage
Estimated twinning fraction	0.047 for h,-h-k,-l	Xtrriage
$F_o, F_c$ correlation	0.96	EDS
Total number of atoms	4396	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	84.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.37% 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](#)

Bond lengths and bond angles in the following residue types are not validated in this section: SO4

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	0.60	0/2218	0.77	2/2988 (0.1%)
1	B	0.54	0/2175	0.72	1/2936 (0.0%)
All	All	0.57	0/4393	0.75	3/5924 (0.1%)

There are no bond length outliers.

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	397	ARG	NE-CZ-NH2	-6.49	117.06	120.30
1	A	366	LEU	CB-CG-CD1	-5.17	102.20	111.00
1	A	419	ARG	NE-CZ-NH2	-5.02	117.79	120.30

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	2183	0	2193	31	0
1	B	2141	0	2099	37	0
2	A	30	0	0	1	0
2	B	35	0	0	0	0
3	A	4	0	0	0	0
3	B	3	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
All	All	4396	0	4292	68	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 8.

All (68) 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:343:VAL:HG13	1:A:347:TYR:HB2	1.39	1.02
1:A:343:VAL:CG1	1:A:347:TYR:HB2	2.06	0.85
1:A:177:LEU:HD21	1:A:206:ILE:HD11	1.58	0.85
1:A:339:VAL:HG21	1:A:400:PHE:CD1	2.18	0.79
1:B:222:ILE:HD11	1:B:270:PHE:CZ	2.19	0.79
1:A:339:VAL:HG12	1:A:403:PHE:CD1	2.18	0.78
1:A:188:ARG:HG3	1:A:191:ARG:HH12	1.54	0.72
1:B:222:ILE:HD11	1:B:270:PHE:CE2	2.25	0.71
1:A:177:LEU:CD2	1:A:206:ILE:HD11	2.21	0.71
1:A:339:VAL:HG21	1:A:400:PHE:HD1	1.55	0.69
1:A:165:LEU:HD22	1:A:189:SER:HB2	1.81	0.62
1:B:372:VAL:HG13	1:B:373:PRO:HD2	1.81	0.62
1:B:186:VAL:HG21	1:B:223:ILE:HD13	1.82	0.60
1:B:365:ALA:O	1:B:369:ILE:HG13	2.01	0.60
1:B:224:LYS:CB	1:B:225:PRO:HD3	2.33	0.59
1:B:222:ILE:CD1	1:B:270:PHE:CE2	2.88	0.56
1:B:226:THR:HG22	1:B:230:LEU:HD11	1.88	0.56
1:A:302:ARG:HG2	2:A:506:SO4:O2	2.06	0.55
1:B:371:THR:HG22	1:B:433:ARG:HG3	1.91	0.53
1:B:367:ASN:O	1:B:370:THR:OG1	2.23	0.53
1:B:249:LYS:O	1:B:253:GLN:HG3	2.10	0.52
1:A:364:GLU:HB3	1:A:426:LYS:HD3	1.91	0.51
1:A:339:VAL:CG1	1:A:403:PHE:CD1	2.92	0.51
1:B:311:LEU:O	1:B:316:ARG:NH2	2.45	0.50
1:B:165:LEU:HD12	1:B:165:LEU:O	2.11	0.49
1:A:297:ILE:HG22	1:A:304:MSE:HE2	1.94	0.49
1:B:372:VAL:CG1	1:B:373:PRO:HD2	2.42	0.47
1:B:371:THR:HG23	1:B:433:ARG:HE	1.79	0.47
1:B:319:ILE:HG23	1:B:352:ILE:HD11	1.96	0.47
1:B:280:PHE:O	1:B:284:VAL:HG22	2.14	0.47
1:B:226:THR:HG22	1:B:230:LEU:CD1	2.45	0.47
1:B:371:THR:CG2	1:B:433:ARG:HE	2.28	0.47
1:A:339:VAL:HG21	1:A:400:PHE:CE1	2.50	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:312:ASP:OD2	1:B:314:ASP:N	2.49	0.46
1:A:331:TYR:HE2	1:A:404:THR:HG1	1.63	0.46
1:B:168:LEU:HA	1:B:168:LEU:HD23	1.65	0.46
1:B:293:LYS:O	1:B:297:ILE:HG13	2.15	0.45
1:B:224:LYS:N	1:B:225:PRO:CD	2.80	0.45
1:A:194:ILE:HD12	1:A:210:LEU:HD11	1.99	0.45
1:B:307:ILE:HD13	1:B:307:ILE:HA	1.90	0.45
1:A:343:VAL:HG13	1:A:347:TYR:CB	2.28	0.44
1:A:288:ALA:HB3	1:A:289:PRO:HD3	1.99	0.44
1:B:221:LYS:HD3	1:B:221:LYS:HA	1.85	0.44
1:A:198:GLN:O	1:A:201:LEU:HD12	2.17	0.44
1:B:385:LEU:HD13	1:B:385:LEU:C	2.37	0.44
1:A:293:LYS:HE3	1:A:311:LEU:O	2.19	0.43
1:B:308:TYR:HE2	1:B:319:ILE:HD11	1.83	0.43
1:B:232:THR:HG21	1:B:292:ARG:HE	1.84	0.42
1:B:354:ILE:CG2	1:B:415:GLY:HA3	2.50	0.42
1:A:366:LEU:HD12	1:A:385:LEU:HD21	2.01	0.42
1:B:339:VAL:HG12	1:B:411:ILE:HD11	2.02	0.42
1:A:296:GLU:HA	1:A:299:LYS:HE2	2.01	0.42
1:B:242:ASP:HA	1:B:243:PRO:HD3	1.92	0.42
1:A:258:ARG:HB3	1:A:346:TYR:HD1	1.84	0.42
1:A:339:VAL:CG2	1:A:400:PHE:CE1	3.02	0.42
1:B:318:THR:HG21	1:B:352:ILE:HG23	2.02	0.41
1:A:327:ILE:HG23	1:A:332:ASP:HA	2.01	0.41
1:A:318:THR:HG21	1:A:352:ILE:HG23	2.02	0.41
1:B:371:THR:CG2	1:B:433:ARG:NE	2.83	0.41
1:A:174:ASP:HA	1:A:175:PRO:HD3	1.69	0.41
1:A:376:VAL:HG22	1:A:377:VAL:HG13	2.01	0.41
1:B:288:ALA:HB3	1:B:289:PRO:HD3	2.02	0.41
1:B:300:ASN:OD1	1:B:300:ASN:N	2.55	0.40
1:A:168:LEU:HA	1:A:168:LEU:HD23	1.83	0.40
1:A:374:ASP:HA	1:A:378:LYS:HD2	2.04	0.40
1:B:240:ILE:HG21	1:B:253:GLN:HG2	2.04	0.40
1:A:201:LEU:HD21	1:A:272:HIS:CE1	2.56	0.40
1:B:280:PHE:CD1	1:B:280:PHE:C	2.95	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	273/375 (73%)	266 (97%)	6 (2%)	1 (0%)	34	66
1	B	271/375 (72%)	261 (96%)	8 (3%)	2 (1%)	22	53
All	All	544/750 (72%)	527 (97%)	14 (3%)	3 (1%)	25	56

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	187	SER
1	B	168	LEU
1	B	376	VAL

### 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	228/294 (78%)	222 (97%)	6 (3%)	46	79
1	B	221/294 (75%)	213 (96%)	8 (4%)	35	69
All	All	449/588 (76%)	435 (97%)	14 (3%)	40	74

All (14) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	220	GLU
1	A	228	SER
1	A	274	SER

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Mol	Chain	Res	Type
1	A	343	VAL
1	A	376	VAL
1	A	414	ASP
1	B	180	LEU
1	B	186	VAL
1	B	194	ILE
1	B	204	ASP
1	B	220	GLU
1	B	250	THR
1	B	399	THR
1	B	433	ARG

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

Mol	Chain	Res	Type
1	A	338	ASN

### 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](#)

13 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	SO4	B	506	-	4,4,4	0.33	0	6,6,6	0.34	0
2	SO4	B	502	-	4,4,4	0.38	0	6,6,6	0.21	0
2	SO4	B	505	-	4,4,4	0.41	0	6,6,6	0.79	0
2	SO4	A	505	-	4,4,4	0.62	0	6,6,6	0.67	0
2	SO4	B	501	-	4,4,4	0.42	0	6,6,6	0.60	0
2	SO4	A	501	-	4,4,4	0.31	0	6,6,6	0.39	0
2	SO4	A	506	-	4,4,4	0.39	0	6,6,6	0.72	0
2	SO4	A	502	-	4,4,4	0.50	0	6,6,6	0.73	0
2	SO4	B	507	-	4,4,4	0.35	0	6,6,6	0.20	0
2	SO4	A	503	-	4,4,4	0.32	0	6,6,6	0.34	0
2	SO4	B	503	-	4,4,4	0.43	0	6,6,6	0.18	0
2	SO4	B	504	-	4,4,4	0.65	0	6,6,6	0.82	0
2	SO4	A	504	-	4,4,4	0.32	0	6,6,6	0.78	0

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	506	SO4	1	0

## 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	271/375 (72%)	-0.25	1 (0%) 92 91	40, 69, 106, 143	0
1	B	269/375 (71%)	0.03	5 (1%) 66 59	53, 92, 141, 172	0
All	All	540/750 (72%)	-0.11	6 (1%) 80 75	40, 80, 133, 172	0

All (6) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	177	LEU	2.8
1	A	377	VAL	2.4
1	B	180	LEU	2.4
1	B	207	TYR	2.4
1	B	210	LEU	2.2
1	B	165	LEU	2.1

### 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. 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( $\text{\AA}^2$ )	Q<0.9
2	SO4	B	503	5/5	0.81	0.16	109,128,163,173	0
2	SO4	A	505	5/5	0.84	0.20	89,94,114,164	0
2	SO4	B	506	5/5	0.84	0.23	93,126,169,183	0
2	SO4	B	507	5/5	0.88	0.22	107,130,155,197	5
2	SO4	B	502	5/5	0.88	0.17	129,143,154,222	0
2	SO4	B	501	5/5	0.90	0.36	77,79,109,116	5
2	SO4	A	506	5/5	0.92	0.16	66,77,109,114	5
2	SO4	B	504	5/5	0.93	0.16	69,83,94,142	0
2	SO4	B	505	5/5	0.95	0.23	86,91,100,120	0
2	SO4	A	504	5/5	0.95	0.14	72,79,108,126	0
2	SO4	A	502	5/5	0.98	0.18	63,67,84,89	0
2	SO4	A	501	5/5	0.98	0.14	56,67,81,106	0
2	SO4	A	503	5/5	0.98	0.12	70,76,84,96	5

## 6.5 Other polymers [\(i\)](#)

There are no such residues in this entry.