



# Full wwPDB X-ray Structure Validation Report ⓘ

Jun 22, 2024 – 09:42 AM EDT

PDB ID : 6GGP  
Title : Structure of the ligand-free form of truncated ArgBP (residues 20-233) from *T. maritima*  
Authors : Smaldone, G.; Berisio, R.; Balasco, N.; D'Auria, S.; Vitagliano, L.; Ruggiero, A.  
Deposited on : 2018-05-03  
Resolution : 1.03 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  
Xtriage (Phenix) : 1.20.1  
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

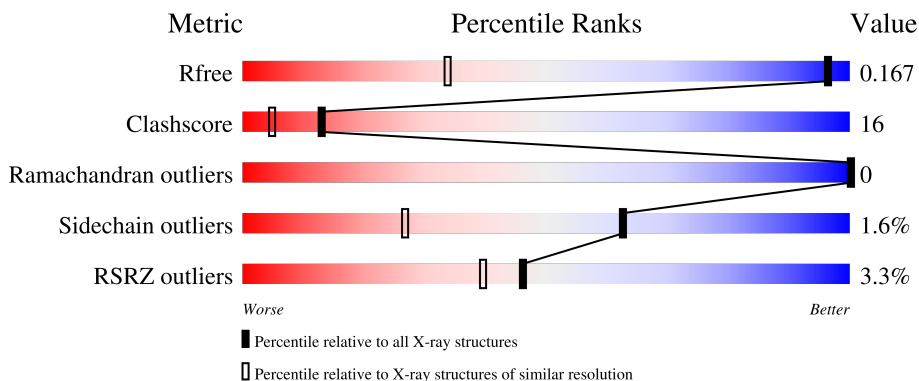
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.03 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	1596 (1.10-0.98)
Clashscore	141614	1677 (1.10-0.98)
Ramachandran outliers	138981	1591 (1.10-0.98)
Sidechain outliers	138945	1589 (1.10-0.98)
RSRZ outliers	127900	1557 (1.10-0.98)

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	212	

## 2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 2264 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 Amino acid ABC transporter, periplasmic amino acid-binding protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	212	1793	1165	286	340	2	0	24	0

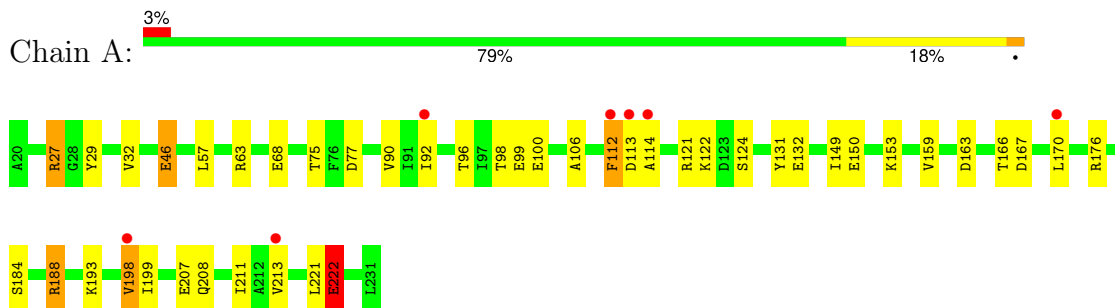
- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	471	Total	O	0	0
			471	471		

### 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: Amino acid ABC transporter, periplasmic amino acid-binding protein



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	34.71Å 71.06Å 88.39Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	15.00 – 1.03 18.03 – 1.03	Depositor EDS
% Data completeness (in resolution range)	95.8 (15.00-1.03) 95.8 (18.03-1.03)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.55 (at 1.03Å)	Xtrriage
Refinement program	REFMAC 5.5.0110	Depositor
R, $R_{free}$	0.137 , 0.171 0.138 , 0.167	Depositor DCC
$R_{free}$ test set	969 reflections (0.93%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	9.7	Xtrriage
Anisotropy	0.009	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.33 , 38.9	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	0.97	EDS
Total number of atoms	2264	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	13.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 7.16% 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	1.27	19/1880 (1.0%)	1.20	16/2536 (0.6%)

All (19) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	222	GLU	CG-CD	10.56	1.67	1.51
1	A	188[A]	ARG	CZ-NH2	9.89	1.46	1.33
1	A	188[B]	ARG	CZ-NH2	9.89	1.46	1.33
1	A	198[A]	VAL	CB-CG2	-9.72	1.32	1.52
1	A	198[B]	VAL	CB-CG2	-9.72	1.32	1.52
1	A	100	GLU	CG-CD	8.69	1.65	1.51
1	A	159	VAL	CB-CG2	-8.65	1.34	1.52
1	A	222	GLU	CD-OE2	7.70	1.34	1.25
1	A	99	GLU	CD-OE1	7.22	1.33	1.25
1	A	222	GLU	CD-OE1	6.85	1.33	1.25
1	A	208	GLN	CA-CB	6.52	1.68	1.53
1	A	150	GLU	CD-OE2	5.86	1.32	1.25
1	A	132	GLU	CD-OE2	-5.44	1.19	1.25
1	A	46[A]	GLU	CD-OE1	-5.40	1.19	1.25
1	A	46[B]	GLU	CD-OE1	-5.40	1.19	1.25
1	A	167	ASP	CB-CG	5.12	1.62	1.51
1	A	131	TYR	CG-CD2	-5.12	1.32	1.39
1	A	46[A]	GLU	CD-OE2	-5.04	1.20	1.25
1	A	46[B]	GLU	CD-OE2	-5.04	1.20	1.25

All (16) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	176	ARG	NE-CZ-NH1	15.48	128.04	120.30
1	A	176	ARG	NE-CZ-NH2	-14.45	113.08	120.30
1	A	188[A]	ARG	NE-CZ-NH1	-9.13	115.73	120.30
1	A	188[B]	ARG	NE-CZ-NH1	-9.13	115.73	120.30
1	A	188[A]	ARG	NE-CZ-NH2	7.48	124.04	120.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	188[B]	ARG	NE-CZ-NH2	7.48	124.04	120.30
1	A	27	ARG	CA-CB-CG	6.90	128.58	113.40
1	A	167	ASP	CB-CG-OD2	-6.31	112.62	118.30
1	A	176	ARG	CD-NE-CZ	6.04	132.06	123.60
1	A	112[A]	PHE	O-C-N	6.00	132.31	122.70
1	A	112[B]	PHE	O-C-N	6.00	132.31	122.70
1	A	27	ARG	CG-CD-NE	5.86	124.09	111.80
1	A	176	ARG	CG-CD-NE	-5.46	100.33	111.80
1	A	63	ARG	NE-CZ-NH2	-5.12	117.74	120.30
1	A	112[A]	PHE	CA-C-N	-5.04	106.12	117.20
1	A	112[B]	PHE	CA-C-N	-5.04	106.12	117.20

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	1793	0	1908	61	0
2	A	471	0	0	23	1
All	All	2264	0	1908	61	1

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 16.

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:122[B]:LYS:CE	1:A:122[B]:LYS:NZ	1.83	1.41
1:A:112[B]:PHE:HE2	1:A:114:ALA:CA	1.46	1.29
1:A:112[B]:PHE:CE2	1:A:114:ALA:HA	1.69	1.26
1:A:112[B]:PHE:CE2	1:A:114:ALA:CA	2.25	1.17
1:A:75[A]:THR:HG21	2:A:460:HOH:O	1.63	0.96
1:A:112[B]:PHE:HE2	1:A:114:ALA:HA	0.99	0.96
1:A:112[B]:PHE:HE2	1:A:114:ALA:CB	1.82	0.91

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:32:VAL:CG1	1:A:92[B]:ILE:HG22	2.06	0.86
1:A:112[B]:PHE:CE2	1:A:114:ALA:N	2.46	0.82
1:A:166[A]:THR:HG23	2:A:366:HOH:O	1.79	0.82
1:A:113[C]:ASP:CG	2:A:301:HOH:O	2.20	0.78
1:A:112[B]:PHE:CE2	1:A:114:ALA:CB	2.63	0.78
1:A:68:GLU:HG2	2:A:484:HOH:O	1.82	0.78
1:A:112[B]:PHE:CE2	1:A:114:ALA:HB2	2.21	0.75
1:A:112[B]:PHE:CD2	1:A:114:ALA:N	2.58	0.72
1:A:113[C]:ASP:OD1	2:A:301:HOH:O	2.08	0.71
1:A:114:ALA:O	2:A:302:HOH:O	2.10	0.68
1:A:188[A]:ARG:HG2	1:A:188[A]:ARG:HH11	1.61	0.66
1:A:166[A]:THR:HG22	2:A:350:HOH:O	1.98	0.64
1:A:153:LYS:HD2	2:A:312:HOH:O	1.98	0.62
1:A:113[C]:ASP:CB	2:A:301:HOH:O	2.47	0.61
1:A:114:ALA:C	2:A:302:HOH:O	2.38	0.61
1:A:77:ASP:HB2	2:A:604:HOH:O	2.01	0.61
1:A:213[A]:VAL:HG21	1:A:221:LEU:HD13	1.84	0.60
1:A:32:VAL:HG13	1:A:92[B]:ILE:HG22	1.82	0.60
1:A:188[B]:ARG:HG2	1:A:199[B]:ILE:CD1	2.32	0.59
1:A:188[B]:ARG:HG2	1:A:199[B]:ILE:HD12	1.83	0.59
1:A:193:LYS:HE2	2:A:324:HOH:O	2.03	0.57
1:A:207:GLU:OE2	2:A:303:HOH:O	2.17	0.56
1:A:32:VAL:CG1	1:A:92[B]:ILE:CG2	2.83	0.56
1:A:92[B]:ILE:HD13	1:A:211:ILE:HG12	1.88	0.56
1:A:32:VAL:HG11	1:A:92[B]:ILE:CG2	2.36	0.56
1:A:96[A]:THR:HG23	2:A:642:HOH:O	2.07	0.54
1:A:106:ALA:HB3	1:A:213[A]:VAL:HG23	1.91	0.53
1:A:92[B]:ILE:CD1	1:A:211:ILE:HG12	2.40	0.51
1:A:184[B]:SER:OG	2:A:304:HOH:O	2.18	0.51
1:A:149[B]:ILE:HD11	2:A:631:HOH:O	2.10	0.51
1:A:32:VAL:HG11	1:A:92[B]:ILE:HG22	1.89	0.50
1:A:170[A]:LEU:HD23	2:A:729:HOH:O	2.12	0.50
1:A:112[B]:PHE:CD2	1:A:114:ALA:HB2	2.47	0.49
1:A:188[A]:ARG:HH11	1:A:188[A]:ARG:CG	2.24	0.49
1:A:96[A]:THR:CG2	2:A:642:HOH:O	2.60	0.49
1:A:121[B]:ARG:NH2	2:A:311:HOH:O	2.45	0.48
1:A:193:LYS:CE	2:A:324:HOH:O	2.61	0.47
1:A:222:GLU:CG	2:A:322:HOH:O	2.61	0.47
1:A:27:ARG:HG2	1:A:29:TYR:CE1	2.49	0.47
1:A:188[A]:ARG:HG2	1:A:188[A]:ARG:NH1	2.28	0.47
1:A:188[A]:ARG:CG	1:A:188[A]:ARG:NH1	2.77	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:112[B]:PHE:CZ	1:A:114:ALA:HA	2.38	0.45
1:A:96[A]:THR:HG22	1:A:98:THR:HG23	1.99	0.45
1:A:57:LEU:HD23	1:A:92[B]:ILE:HD11	2.00	0.43
1:A:90:VAL:HG12	1:A:213[A]:VAL:HG12	2.02	0.42
1:A:113[C]:ASP:HB3	2:A:301:HOH:O	2.17	0.42
1:A:222:GLU:HG2	2:A:322:HOH:O	2.20	0.41

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:A:579:HOH:O	2:A:644:HOH:O[2_545]	2.19	0.01

## 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	236/212 (111%)	233 (99%)	3 (1%)	0	<b>100</b> <b>100</b>

There are no Ramachandran outliers to report.

### 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	208/182 (114%)	203 (98%)	5 (2%)	49 14

All (5) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	124[A]	SER
1	A	124[B]	SER
1	A	163[A]	ASP
1	A	163[B]	ASP
1	A	222	GLU

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	47	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 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

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	212/212 (100%)	0.36	7 (3%) 46 39	6, 10, 16, 21	0

All (7) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	113[A]	ASP	3.6
1	A	92[A]	ILE	2.9
1	A	170[A]	LEU	2.6
1	A	198[A]	VAL	2.3
1	A	213[A]	VAL	2.2
1	A	114	ALA	2.0
1	A	112[A]	PHE	2.0

### 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.