



# wwPDB X-ray Structure Validation Summary Report ⓘ

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PDB ID : 3NAF  
Title : Structure of the Intracellular Gating Ring from the Human High-conductance Ca<sup>2+</sup> gated K<sup>+</sup> Channel (BK Channel)  
Authors : Wu, Y.; Yang, Y.; Ye, S.; Jiang, Y.  
Deposited on : 2010-06-01  
Resolution : 3.10 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  
<http://wwpdb.org/validation/2016/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 : 1.7 (RC4), CSD as536be (2015)  
Xtriage (Phenix) : 1.9-1692  
EDS : rb-20026688  
Percentile statistics : 20151230.v01 (using entries in the PDB archive December 30th 2015)  
Refmac : 5.8.0135  
CCP4 : 6.5.0  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : trunk26865

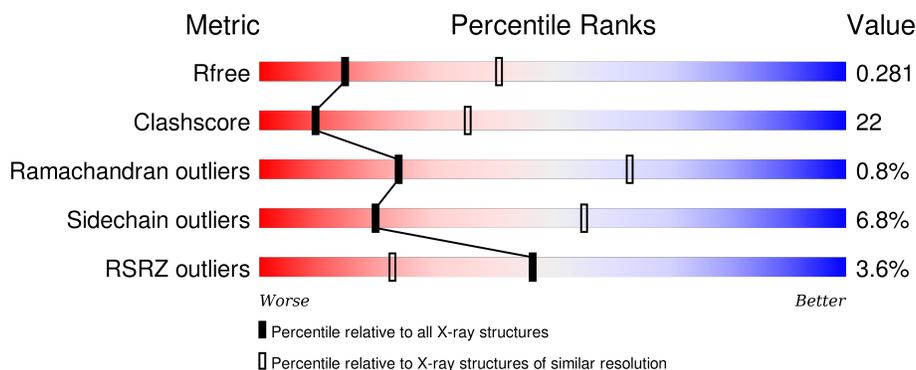
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 3.10 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))
$R_{free}$	91344	1114 (3.14-3.06)
Clashscore	102246	1222 (3.14-3.06)
Ramachandran outliers	100387	1174 (3.14-3.06)
Sidechain outliers	100360	1174 (3.14-3.06)
RSRZ outliers	91569	1119 (3.14-3.06)

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. 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	798	

## 2 Entry composition [i](#)

There is only 1 type of molecule in this entry. The entry contains 5076 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 Calcium-activated potassium channel subunit alpha-1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	648	5076	3237	855	948	36	0	0	0

There are 40 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	290	GLY	-	EXPRESSION TAG	UNP Q12791
A	291	ALA	-	EXPRESSION TAG	UNP Q12791
A	292	MET	-	EXPRESSION TAG	UNP Q12791
A	293	PRO	-	EXPRESSION TAG	UNP Q12791
A	294	ASP	-	EXPRESSION TAG	UNP Q12791
A	295	GLU	-	EXPRESSION TAG	UNP Q12791
A	296	PHE	-	EXPRESSION TAG	UNP Q12791
A	297	ARG	-	EXPRESSION TAG	UNP Q12791
A	298	MET	-	EXPRESSION TAG	UNP Q12791
A	299	LYS	-	EXPRESSION TAG	UNP Q12791
A	300	GLN	-	EXPRESSION TAG	UNP Q12791
A	301	ILE	-	EXPRESSION TAG	UNP Q12791
A	302	GLU	-	EXPRESSION TAG	UNP Q12791
A	303	ASP	-	EXPRESSION TAG	UNP Q12791
A	304	LYS	-	EXPRESSION TAG	UNP Q12791
A	305	LEU	-	EXPRESSION TAG	UNP Q12791
A	306	GLU	-	EXPRESSION TAG	UNP Q12791
A	307	GLU	-	EXPRESSION TAG	UNP Q12791
A	308	ILE	-	EXPRESSION TAG	UNP Q12791
A	309	LEU	-	EXPRESSION TAG	UNP Q12791
A	310	SER	-	EXPRESSION TAG	UNP Q12791
A	311	LYS	-	EXPRESSION TAG	UNP Q12791
A	312	LEU	-	EXPRESSION TAG	UNP Q12791
A	313	TYR	-	EXPRESSION TAG	UNP Q12791
A	314	HIS	-	EXPRESSION TAG	UNP Q12791
A	315	ILE	-	EXPRESSION TAG	UNP Q12791
A	316	GLU	-	EXPRESSION TAG	UNP Q12791

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Chain	Residue	Modelled	Actual	Comment	Reference
A	317	ASN	-	EXPRESSION TAG	UNP Q12791
A	318	GLU	-	EXPRESSION TAG	UNP Q12791
A	319	LEU	-	EXPRESSION TAG	UNP Q12791
A	320	ALA	-	EXPRESSION TAG	UNP Q12791
A	321	ARG	-	EXPRESSION TAG	UNP Q12791
A	322	ILE	-	EXPRESSION TAG	UNP Q12791
A	323	LYS	-	EXPRESSION TAG	UNP Q12791
A	324	LYS	-	EXPRESSION TAG	UNP Q12791
A	325	LEU	-	EXPRESSION TAG	UNP Q12791
A	326	LEU	-	EXPRESSION TAG	UNP Q12791
A	327	GLY	-	EXPRESSION TAG	UNP Q12791
A	328	GLU	-	EXPRESSION TAG	UNP Q12791
A	329	ARG	-	EXPRESSION TAG	UNP Q12791



## 4 Data and refinement statistics

Property	Value	Source
Space group	I 4 2 2	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	134.40Å 134.40Å 231.84Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	49.48 – 3.10 49.48 – 3.05	Depositor EDS
% Data completeness (in resolution range)	88.2 (49.48-3.10) 86.5 (49.48-3.05)	Depositor EDS
$R_{merge}$	0.06	Depositor
$R_{sym}$	0.06	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.46 (at 3.07Å)	Xtrriage
Refinement program	PHENIX (phenix.refine: 1.6.1_357)	Depositor
R, $R_{free}$	0.238 , 0.289 0.226 , 0.281	Depositor DCC
$R_{free}$ test set	1766 reflections (10.03%)	DCC
Wilson B-factor (Å <sup>2</sup> )	99.7	Xtrriage
Anisotropy	0.505	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.31 , 102.3	EDS
Estimated twinning fraction	No twinning to report.	Xtrriage
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtrriage
Outliers	0 of 19761 reflections	Xtrriage
$F_o, F_c$ correlation	0.93	EDS
Total number of atoms	5076	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	139.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.64% 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, 0.375 respectively for untwinned datasets, and 0.333, 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	0.24	0/5100	0.49	5/6909 (0.1%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	1

There are no bond length outliers.

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	691	MET	CG-SD-CE	13.79	122.26	100.20
1	A	661	LYS	CB-CA-C	-6.33	97.73	110.40
1	A	964	SER	CB-CA-C	5.92	121.35	110.10
1	A	964	SER	N-CA-C	-5.15	97.08	111.00
1	A	661	LYS	N-CA-C	5.04	124.61	111.00

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	663	MET	Peptide

### 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	5076	0	4981	225	0
All	All	5076	0	4981	225	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 22.

The worst 5 of 225 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:665:HIS:O	1:A:665:HIS:HD2	1.31	1.12
1:A:665:HIS:O	1:A:665:HIS:CD2	2.02	1.12
1:A:664:ARG:HG2	1:A:664:ARG:NH1	1.47	1.08
1:A:664:ARG:HH11	1:A:664:ARG:CG	1.61	1.05
1:A:664:ARG:HD3	1:A:665:HIS:N	1.82	0.94

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	624/798 (78%)	549 (88%)	70 (11%)	5 (1%)	24 63

All (5) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	335	SER
1	A	792	VAL
1	A	743	ALA
1	A	793	ASN
1	A	810	ILE

### 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	555/692 (80%)	517 (93%)	38 (7%)	20 55

5 of 38 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	718	HIS
1	A	771	HIS
1	A	1022	LEU
1	A	745	ASN
1	A	795	ASN

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

Mol	Chain	Res	Type
1	A	397	GLN
1	A	616	HIS
1	A	665	HIS
1	A	747	HIS
1	A	831	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 carbohydrates 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	632/798 (79%)	0.25	23 (3%) 46 23	82, 132, 210, 281	0

The worst 5 of 23 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	574	ASN	4.4
1	A	984	ASP	3.5
1	A	575	ARG	3.4
1	A	521	GLU	3.4
1	A	1059	ALA	3.3

### 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](#)

There are no ligands in this entry.

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

There are no such residues in this entry.