



# Full wwPDB X-ray Structure Validation Report ⓘ

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PDB ID : 4YZY  
Title : Crystal structures reveal transient PERK luminal domain tetramerization in ER stress signaling  
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Deposited on : 2015-03-25  
Resolution : 3.20 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  
<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

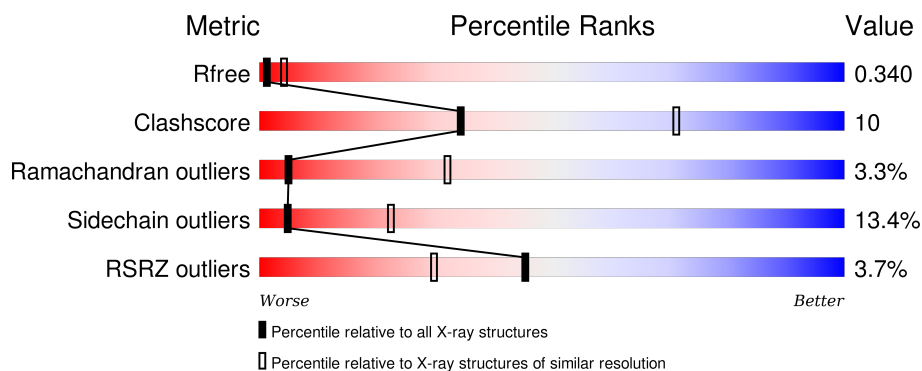
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

## *X-RAY DIFFRACTION*

The reported resolution of this entry is 3.20 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	1124 (3.24-3.16)
Clashscore	102246	1024 (3.22-3.18)
Ramachandran outliers	100387	1004 (3.22-3.18)
Sidechain outliers	100360	1003 (3.22-3.18)
RSRZ outliers	91569	1129 (3.24-3.16)

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	301	

## 2 Entry composition

There is only 1 type of molecule in this entry. The entry contains 1186 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 Eukaryotic translation initiation factor 2-alpha kinase 3.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	163	Total	C	N	O	S	0	0	0
			1186	759	200	223	4			

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	103	ALA	-	expression tag	UNP Q9Z2B5
A	201	THR	ILE	conflict	UNP Q9Z2B5



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 31 2 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	90.77Å 90.77Å 75.22Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	54.35 – 3.20 54.35 – 3.09	Depositor EDS
% Data completeness (in resolution range)	93.7 (54.35-3.20) 97.6 (54.35-3.09)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	0.08	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.10 (at 3.07Å)	Xtriage
Refinement program	PHENIX (phenix.refine: dev_1448)	Depositor
R, $R_{free}$	0.290 , 0.305 0.342 , 0.340	Depositor DCC
$R_{free}$ test set	290 reflections (5.05%)	DCC
Wilson B-factor (Å <sup>2</sup> )	113.2	Xtriage
Anisotropy	0.117	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.32 , 118.8	EDS
Estimated twinning fraction	0.038 for -h,-k,l	Xtriage
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.50$ , $\langle L^2 \rangle = 0.33$	Xtriage
Outliers	0 of 6677 reflections	Xtriage
$F_o, F_c$ correlation	0.87	EDS
Total number of atoms	1186	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	136.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.70% 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	0.23	0/1205	0.48	0/1638

There are no bond length outliers.

There are no bond angle outliers.

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	1186	0	1125	23	0
All	All	1186	0	1125	23	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 10.

All (23) 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:213:ARG:HH22	1:A:235:ILE:HA	1.37	0.87
1:A:329:LEU:HD12	1:A:329:LEU:H	1.56	0.69
1:A:344:LEU:HB3	1:A:351:ILE:HG23	1.77	0.67
1:A:193:VAL:HG23	1:A:250:PRO:HG3	1.80	0.63
1:A:213:ARG:NH2	1:A:235:ILE:HA	2.13	0.60

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:143:SER:OG	1:A:255:GLU:O	2.19	0.55
1:A:345:VAL:HG22	1:A:350:VAL:HG12	1.88	0.55
1:A:255:GLU:OE2	1:A:258:ASN:ND2	2.30	0.53
1:A:105:LEU:HD12	1:A:117:ALA:HB1	1.90	0.53
1:A:192:VAL:HA	1:A:250:PRO:HD3	1.90	0.53
1:A:205:LEU:O	1:A:213:ARG:NH2	2.41	0.53
1:A:252:SER:O	1:A:254:SER:N	2.43	0.52
1:A:307:ASP:OD1	1:A:308:THR:N	2.39	0.51
1:A:237:LEU:HB2	1:A:269:ILE:HD11	1.95	0.47
1:A:205:LEU:C	1:A:213:ARG:HH21	2.17	0.47
1:A:130:LEU:HD22	1:A:205:LEU:HD11	1.97	0.46
1:A:349:LYS:HE2	1:A:351:ILE:HG22	1.99	0.44
1:A:110:THR:OG1	1:A:112:ASP:OD1	2.25	0.44
1:A:248:VAL:HG23	1:A:253:GLY:HA2	1.99	0.43
1:A:239:GLN:OE1	1:A:265:GLU:HB2	2.18	0.43
1:A:347:ASP:OD1	1:A:349:LYS:HG3	2.17	0.43
1:A:111:LEU:HG	1:A:338:PRO:HB2	2.01	0.42
1:A:237:LEU:HA	1:A:237:LEU:HD22	1.90	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	151/301 (50%)	127 (84%)	19 (13%)	5 (3%)	5	32

All (5) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	253	GLY
1	A	255	GLU
1	A	347	ASP

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Mol	Chain	Res	Type
1	A	325	LYS
1	A	323	SER

### 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	119/257 (46%)	103 (87%)	16 (13%)	5	22

All (16) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	111	LEU
1	A	130	LEU
1	A	205	LEU
1	A	216	CYS
1	A	219	LEU
1	A	237	LEU
1	A	239	GLN
1	A	245	VAL
1	A	248	VAL
1	A	266	LEU
1	A	269	ILE
1	A	329	LEU
1	A	337	THR
1	A	349	LYS
1	A	350	VAL
1	A	351	ILE

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	122	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](#)

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	163/301 (54%)	0.32	6 (3%) 45 30	89, 126, 201, 333	0

All (6) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	353	ILE	3.8
1	A	354	SER	2.9
1	A	207	ALA	2.6
1	A	212	LEU	2.2
1	A	347	ASP	2.1
1	A	344	LEU	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 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.