



# Full wwPDB X-ray Structure Validation Report ⓘ

Feb 1, 2016 – 10:04 PM GMT

PDB ID : 4WPC  
Title : Crystal structure of Rgd1p F-BAR domain in complex with inositol phosphate  
Authors : Moravcevic, K.; Lemmon, M.A.  
Deposited on : 2014-10-17  
Resolution : 3.34 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

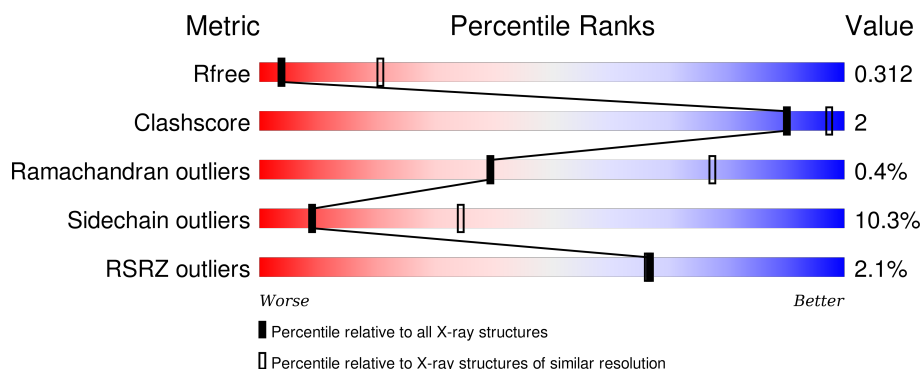
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 3.34 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	1004 (3.40-3.28)
Clashscore	102246	1072 (3.40-3.28)
Ramachandran outliers	100387	1055 (3.40-3.28)
Sidechain outliers	100360	1054 (3.40-3.28)
RSRZ outliers	91569	1009 (3.40-3.28)

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	317	<div> <div style="width: 100%; height: 10px; background: linear-gradient(to right, red 1%, orange 1%, yellow 1%, green 78%, grey 11%);"></div> <div style="display: flex; justify-content: space-between; width: 100%;"> <span>%</span> <span>78%</span> <span>9%</span> <span>•</span> <span>11%</span> </div> </div>
1	B	317	<div> <div style="width: 100%; height: 10px; background: linear-gradient(to right, red 3%, orange 1%, yellow 10%, green 80%, grey 9%);"></div> <div style="display: flex; justify-content: space-between; width: 100%;"> <span>3%</span> <span>80%</span> <span>10%</span> <span>•</span> <span>9%</span> </div> </div>

## 2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 8441 atoms, of which 4055 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.

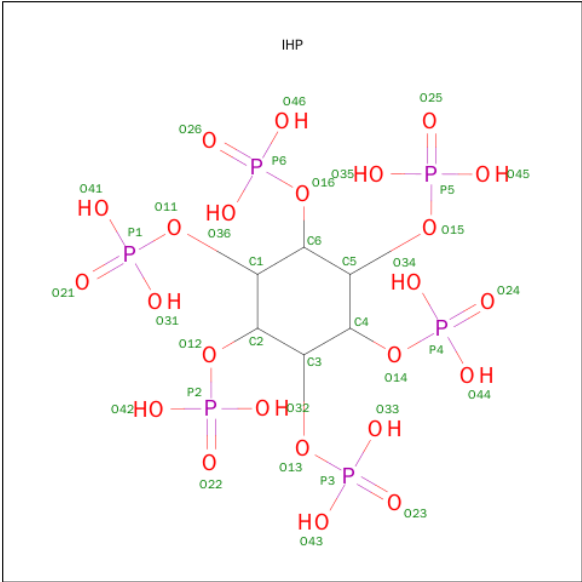
- Molecule 1 is a protein called RHO GTPase-activating protein RGD1.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	283	Total	C	H	N	O	S	0	0	0
			4152	1351	2020	362	410	9			
1	B	288	Total	C	H	N	O	S	0	0	0
			4209	1370	2035	368	427	9			

There are 14 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	17	MET	-	initiating methionine	UNP P38339
A	18	HIS	-	expression tag	UNP P38339
A	19	HIS	-	expression tag	UNP P38339
A	20	HIS	-	expression tag	UNP P38339
A	21	HIS	-	expression tag	UNP P38339
A	22	HIS	-	expression tag	UNP P38339
A	23	HIS	-	expression tag	UNP P38339
B	17	MET	-	initiating methionine	UNP P38339
B	18	HIS	-	expression tag	UNP P38339
B	19	HIS	-	expression tag	UNP P38339
B	20	HIS	-	expression tag	UNP P38339
B	21	HIS	-	expression tag	UNP P38339
B	22	HIS	-	expression tag	UNP P38339
B	23	HIS	-	expression tag	UNP P38339

- Molecule 2 is INOSITOL HEXAKISPHOSPHATE (three-letter code: IHP) (formula:  $C_6H_{18}O_{24}P_6$ ).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	A	1	Total	C	O	P	0	0
			36	6	24	6		
2	B	1	Total	C	O	P	0	0
			36	6	24	6		

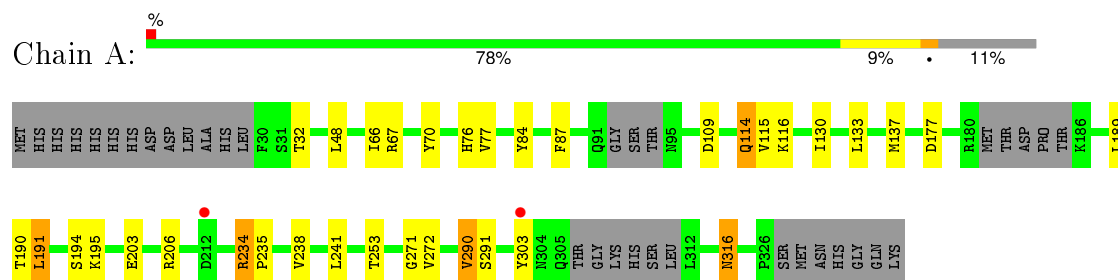
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	6	Total	O	0	0
			6	6		
3	B	2	Total	O	0	0
			2	2		

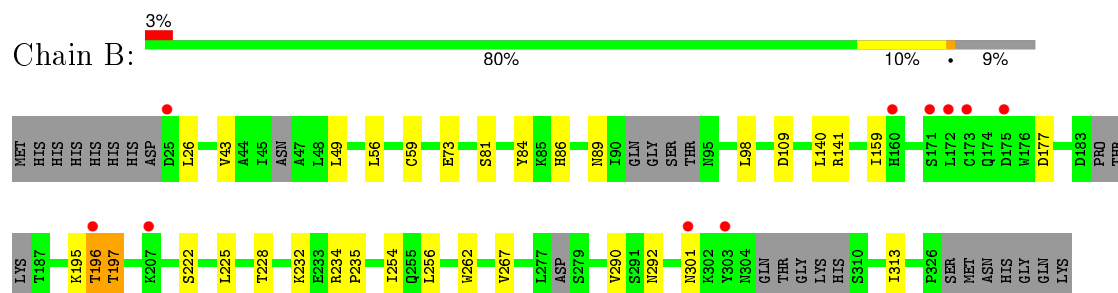
### 3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of errors 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 ( $\text{RSRZ} > 2$ ). 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: RHO GTPase-activating protein RGD1



- Molecule 1: RHO GTPase-activating protein RGD1



## 4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	178.99Å 74.11Å 105.73Å 90.00° 104.27° 90.00°	Depositor
Resolution (Å)	30.77 – 3.34 34.16 – 3.34	Depositor EDS
% Data completeness (in resolution range)	97.9 (30.77-3.34) 98.0 (34.16-3.34)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	3.93 (at 3.32Å)	Xtriage
Refinement program	PHENIX (phenix.refine: 1.9_1692)	Depositor
R, $R_{free}$	0.261 , 0.300 0.277 , 0.312	Depositor DCC
$R_{free}$ test set	995 reflections (5.43%)	DCC
Wilson B-factor (Å <sup>2</sup> )	72.4	Xtriage
Anisotropy	0.200	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.34 , 67.9	EDS
Estimated twinning fraction	No twinning to report.	Xtriage
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.50$ , $\langle L^2 \rangle = 0.33$	Xtriage
Outliers	0 of 19341 reflections	Xtriage
$F_o, F_c$ correlation	0.89	EDS
Total number of atoms	8441	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	70.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.76% 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

### 5.1 Standard geometry

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

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	0.33	0/2161	0.48	0/2927
1	B	0.32	0/2202	0.43	0/2984
All	All	0.33	0/4363	0.45	0/5911

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

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	2132	2020	2031	14	0
1	B	2174	2035	2036	7	0
2	A	36	0	6	0	0
2	B	36	0	6	1	0
3	A	6	0	0	0	0
3	B	2	0	0	0	0
All	All	4386	4055	4079	19	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 2.

All (19) 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:203:GLU:OE1	1:A:206:ARG:NH2	2.29	0.66
1:A:190:THR:OG1	1:A:191:LEU:HA	2.04	0.57
1:A:190:THR:HG23	1:A:191:LEU:CB	2.39	0.53
1:B:196:THR:OG1	1:B:197:THR:N	2.42	0.53
1:A:316:ASN:N	1:A:316:ASN:HD22	2.08	0.50
1:B:49:LEU:O	1:B:141:ARG:NH1	2.47	0.47
1:A:77:VAL:HG22	1:A:116:LYS:HB3	1.98	0.46
1:A:235:PRO:HA	1:A:238:VAL:HG22	1.98	0.45
1:A:190:THR:CB	1:A:191:LEU:HA	2.47	0.45
1:A:290:VAL:O	1:A:291:SER:OG	2.34	0.43
1:A:76:HIS:NE2	1:B:73:GLU:OE2	2.51	0.43
1:B:141:ARG:NH2	2:B:401:IHP:O34	2.51	0.42
1:B:195:LYS:CB	1:B:196:THR:HB	2.50	0.42
1:A:271:GLY:HA2	1:B:267:VAL:HG11	2.01	0.42
1:A:194:SER:OG	1:A:195:LYS:N	2.52	0.42
1:A:234:ARG:N	1:A:235:PRO:HD2	2.35	0.42
1:A:190:THR:HG23	1:A:191:LEU:CA	2.50	0.41
1:A:114:GLN:HG2	1:A:115:VAL:N	2.36	0.41
1:B:234:ARG:HB3	1:B:235:PRO:HD3	2.02	0.41

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	275/317 (87%)	263 (96%)	11 (4%)	1 (0%)	39	77
1	B	276/317 (87%)	255 (92%)	20 (7%)	1 (0%)	39	77
All	All	551/634 (87%)	518 (94%)	31 (6%)	2 (0%)	39	77

All (2) Ramachandran outliers are listed below:



Mol	Chain	Res	Type
1	A	87	PHE
1	B	292	ASN

### 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	221/297 (74%)	200 (90%)	21 (10%)	11	38
1	B	226/297 (76%)	201 (89%)	25 (11%)	8	30
All	All	447/594 (75%)	401 (90%)	46 (10%)	9	34

All (46) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	32	THR
1	A	48	LEU
1	A	66	ILE
1	A	67	ARG
1	A	70	TYR
1	A	84	TYR
1	A	109	ASP
1	A	114	GLN
1	A	130	ILE
1	A	133	LEU
1	A	137	MET
1	A	177	ASP
1	A	189	LEU
1	A	191	LEU
1	A	234	ARG
1	A	241	LEU
1	A	253	THR
1	A	272	VAL
1	A	290	VAL
1	A	303	TYR
1	A	316	ASN
1	B	26	LEU

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Mol	Chain	Res	Type
1	B	43	VAL
1	B	56	LEU
1	B	59	CYS
1	B	81	SER
1	B	84	TYR
1	B	86	HIS
1	B	89	ASN
1	B	98	LEU
1	B	109	ASP
1	B	140	LEU
1	B	159	ILE
1	B	177	ASP
1	B	196	THR
1	B	197	THR
1	B	222	SER
1	B	225	LEU
1	B	228	THR
1	B	232	LYS
1	B	254	ILE
1	B	256	LEU
1	B	262	TRP
1	B	290	VAL
1	B	301	ASN
1	B	313	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	316	ASN

### 5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

## 5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

There are no non-standard protein/DNA/RNA residues in this entry.

## 5.5 Carbohydrates

There are no carbohydrates in this entry.

## 5.6 Ligand geometry

2 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	IHP	A	401	-	36,36,36	1.54	4 (11%)	48,60,60	0.54	0
2	IHP	B	401	1	36,36,36	1.54	4 (11%)	48,60,60	0.54	0

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the chemical component dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	IHP	A	401	-	-	0/30/54/54	0/1/1/1
2	IHP	B	401	1	-	0/30/54/54	0/1/1/1

All (8) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	401	IHP	P5-O25	3.09	1.61	1.51
2	B	401	IHP	P5-O25	3.12	1.61	1.51
2	B	401	IHP	P6-O26	3.13	1.61	1.51
2	A	401	IHP	P6-O26	3.13	1.61	1.51
2	A	401	IHP	P4-O24	3.13	1.61	1.51
2	B	401	IHP	P4-O24	3.14	1.61	1.51
2	A	401	IHP	P2-O22	3.14	1.61	1.51
2	B	401	IHP	P2-O22	3.17	1.61	1.51

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	B	401	IHP	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	283/317 (89%)	-0.06	2 (0%) 89 89	31, 57, 108, 150	0
1	B	288/317 (90%)	0.15	10 (3%) 48 46	31, 62, 113, 152	0
All	All	571/634 (90%)	0.05	12 (2%) 67 66	31, 60, 112, 152	0

All (12) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	25	ASP	3.3
1	B	172	LEU	2.7
1	B	173	CYS	2.5
1	B	175	ASP	2.5
1	B	301	ASN	2.3
1	B	196	THR	2.3
1	B	160	HIS	2.2
1	A	303	TYR	2.2
1	A	212	ASP	2.2
1	B	207	LYS	2.1
1	B	303	TYR	2.1
1	B	171	SER	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](#)

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. LLDF column lists the quality of electron density of the group with respect to its neighbouring residues in protein, DNA or RNA chains. 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	LLDF	B-factors( $\text{\AA}^2$ )	Q<0.9
2	IHP	B	401	36/36	0.61	0.29	-	98,98,98,98	0
2	IHP	A	401	36/36	0.61	0.32	-	98,98,98,98	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.