



Full wwPDB X-ray Structure Validation Report ⓘ

Feb 1, 2016 – 05:20 PM GMT

PDB ID : 4I1A
Title : Crystal Structure of the Apo Form of Rapl
Authors : Parashar, V.; Jeffrey, P.D.; Neiditch, M.B.
Deposited on : 2012-11-20
Resolution : 2.44 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
A user guide is available at
<http://wwpdb.org/validation/2016/XrayValidationReportHelp>
with specific help available everywhere you see the ⓘ symbol.

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

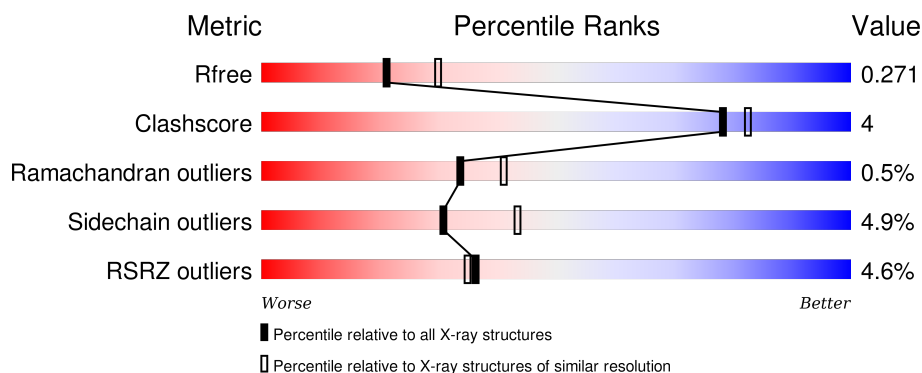
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.44 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	1003 (2.46-2.42)
Clashscore	102246	1071 (2.46-2.42)
Ramachandran outliers	100387	1065 (2.46-2.42)
Sidechain outliers	100360	1065 (2.46-2.42)
RSRZ outliers	91569	1005 (2.46-2.42)

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 ≥ 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	391	
1	B	391	

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 5365 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 Response regulator aspartate phosphatase I.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	274	Total	C	N	O	S	0	0	0
			2312	1506	369	427	10			
1	B	359	Total	C	N	O	S	0	0	0
			3025	1959	479	574	13			

- Molecule 2 is CHLORIDE ION (three-letter code: CL) (formula: Cl).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	B	1	Total	Cl	0	0
			1	1		
2	A	1	Total	Cl	0	0
			1	1		

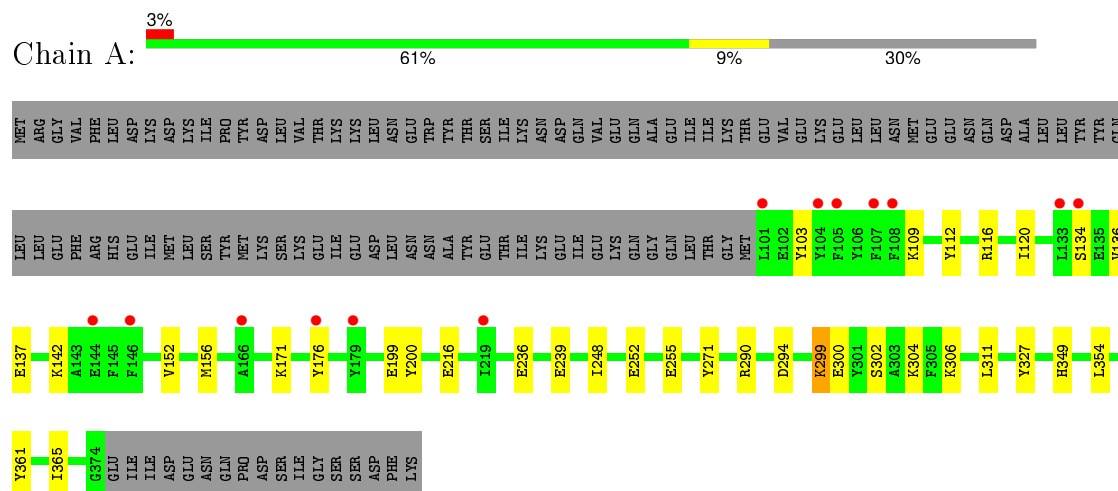
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	15	Total	O	0	0
			15	15		
3	B	11	Total	O	0	0
			11	11		

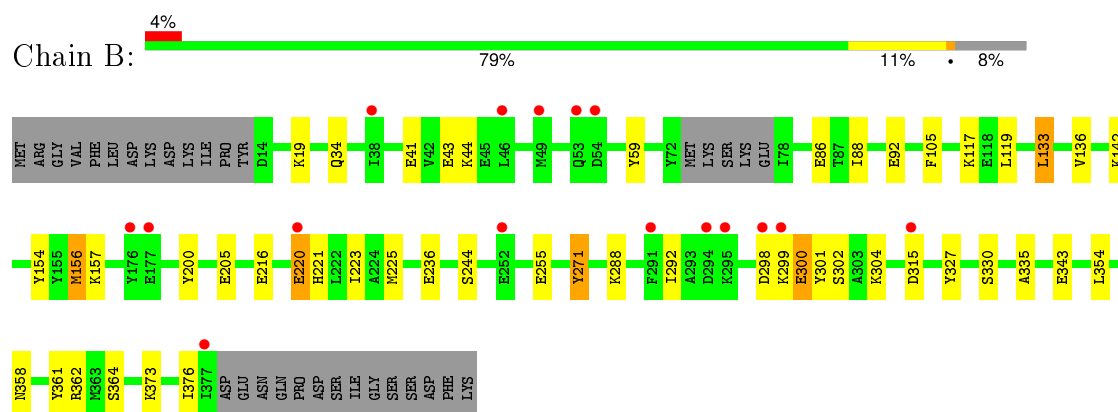
3 Residue-property plots [i](#)

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 ($RSRZ > 2$). 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: Response regulator aspartate phosphatase I



- Molecule 1: Response regulator aspartate phosphatase I



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 2	Depositor
Cell constants a, b, c, α , β , γ	132.90Å 141.21Å 50.53Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	42.27 – 2.44 44.30 – 2.44	Depositor EDS
% Data completeness (in resolution range)	99.0 (42.27-2.44) 99.0 (44.30-2.44)	Depositor EDS
R_{merge}	0.05	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	4.12 (at 2.45Å)	Xtriage
Refinement program	PHENIX (phenix.refine: 1.7.3_928)	Depositor
R, R_{free}	0.221 , 0.270 0.218 , 0.271	Depositor DCC
R_{free} test set	1786 reflections (5.25%)	DCC
Wilson B-factor (Å ²)	58.9	Xtriage
Anisotropy	0.322	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.38 , 58.0	EDS
Estimated twinning fraction	No twinning to report.	Xtriage
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Outliers	0 of 35840 reflections	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	5365	wwPDB-VP
Average B, all atoms (Å ²)	76.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.12% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical 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: CL

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	0.37	0/2363	0.47	0/3164
1	B	0.35	0/3084	0.47	0/4135
All	All	0.36	0/5447	0.47	0/7299

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	2312	0	2279	14	0
1	B	3025	0	2983	26	0
2	A	1	0	0	0	0
2	B	1	0	0	1	0
3	A	15	0	0	0	0
3	B	11	0	0	0	0
All	All	5365	0	5262	38	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 4.

All (38) 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:B:299:LYS:O	1:B:301:TYR:N	2.28	0.66
1:B:255:GLU:OE1	1:B:288:LYS:NZ	2.35	0.60
1:B:41:GLU:HA	1:B:44:LYS:HE2	1.87	0.57
1:A:200:TYR:CE1	1:A:236:GLU:HG3	2.41	0.56
1:B:119:LEU:HB3	1:B:156:MET:HE1	1.87	0.56
1:A:300:GLU:OE1	1:A:304:LYS:NZ	2.38	0.55
1:A:302:SER:O	1:A:306:LYS:HG2	2.11	0.51
1:B:43:GLU:OE1	1:B:59:TYR:OH	2.26	0.49
1:A:361:TYR:O	1:A:365:ILE:HG12	2.15	0.47
1:A:109:LYS:O	1:A:112:TYR:HB3	2.15	0.46
1:B:220:GLU:HA	1:B:223:ILE:HD12	1.97	0.46
1:B:200:TYR:CE1	1:B:236:GLU:HG3	2.51	0.46
1:B:358:ASN:O	1:B:362:ARG:HG3	2.16	0.46
1:A:152:VAL:O	1:A:156:MET:HG3	2.15	0.46
1:B:119:LEU:HD13	1:B:156:MET:HE3	1.97	0.45
1:A:306:LYS:HD3	1:A:306:LYS:HA	1.80	0.45
1:B:136:VAL:O	1:B:142:LYS:HE2	2.17	0.45
1:A:199:GLU:OE1	1:B:373:LYS:NZ	2.45	0.45
1:B:156:MET:HE3	1:B:156:MET:HB3	1.80	0.44
1:B:221:HIS:O	1:B:225:MET:HG2	2.18	0.44
1:A:136:VAL:HG21	1:A:142:LYS:HG3	1.99	0.44
1:B:335:ALA:HB3	2:B:401:CL:CL	2.55	0.43
1:B:92:GLU:HG3	1:B:105:PHE:CD2	2.53	0.43
1:B:271:TYR:OH	1:B:343:GLU:HB3	2.19	0.43
1:A:299:LYS:H	1:A:299:LYS:HG3	1.40	0.43
1:B:300:GLU:O	1:B:304:LYS:HG3	2.20	0.42
1:B:299:LYS:HG2	1:B:302:SER:HB3	2.02	0.42
1:B:117:LYS:HD3	1:B:117:LYS:HA	1.85	0.42
1:B:299:LYS:HB2	1:B:327:TYR:CZ	2.55	0.42
1:A:248:ILE:O	1:A:252:GLU:HG3	2.20	0.42
1:B:288:LYS:O	1:B:292:ILE:HG12	2.20	0.41
1:A:299:LYS:HB2	1:A:327:TYR:OH	2.20	0.41
1:B:354:LEU:O	1:B:358:ASN:HB2	2.20	0.41
1:A:171:LYS:HE2	1:A:171:LYS:HB3	1.82	0.41
1:A:349:HIS:ND1	1:B:358:ASN:OD1	2.47	0.41
1:B:154:TYR:O	1:B:157:LYS:HE3	2.21	0.41
1:B:133:LEU:HA	1:B:133:LEU:HD23	1.97	0.40
1:B:361:TYR:O	1:B:364:SER:HB3	2.22	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	272/391 (70%)	267 (98%)	4 (2%)	1 (0%)	39	49
1	B	355/391 (91%)	343 (97%)	10 (3%)	2 (1%)	30	36
All	All	627/782 (80%)	610 (97%)	14 (2%)	3 (0%)	34	41

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	300	GLU
1	A	176	TYR
1	B	298	ASP

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	245/355 (69%)	231 (94%)	14 (6%)	25	35
1	B	325/355 (92%)	311 (96%)	14 (4%)	35	50
All	All	570/710 (80%)	542 (95%)	28 (5%)	31	43

All (28) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	103	TYR
1	A	116	ARG
1	A	120	ILE

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
1	A	134	SER
1	A	137	GLU
1	A	216	GLU
1	A	239	GLU
1	A	255	GLU
1	A	271	TYR
1	A	290	ARG
1	A	294	ASP
1	A	299	LYS
1	A	311	LEU
1	A	354	LEU
1	B	19	LYS
1	B	34	GLN
1	B	86	GLU
1	B	88	ILE
1	B	133	LEU
1	B	156	MET
1	B	205	GLU
1	B	216	GLU
1	B	220	GLU
1	B	244	SER
1	B	271	TYR
1	B	315	ASP
1	B	330	SER
1	B	376	ILE

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	323	ASN
1	A	339	ASN
1	A	351	GLN
1	B	34	GLN
1	B	323	ASN

5.3.3 RNA ⓘ

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](#)

Of 2 ligands modelled in this entry, 2 are monoatomic - leaving 0 for Mogul analysis.

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.

No monomer is involved in short contacts.

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

6.1 Protein, DNA and RNA chains

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, 95th 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 ²)	Q<0.9
1	A	274/391 (70%)	0.60	13 (4%) 35 34	44, 70, 112, 141	0
1	B	359/391 (91%)	0.51	16 (4%) 37 36	44, 74, 113, 142	0
All	All	633/782 (80%)	0.55	29 (4%) 36 35	44, 72, 113, 142	0

All (29) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	53	GLN	5.9
1	A	176	TYR	5.5
1	A	179	TYR	4.7
1	A	104	TYR	4.4
1	B	295	LYS	4.0
1	A	146	PHE	3.5
1	B	298	ASP	3.4
1	A	107	PHE	3.4
1	B	291	PHE	3.4
1	B	294	ASP	3.3
1	B	377	ILE	3.2
1	A	134	SER	3.0
1	B	177	GLU	2.8
1	B	54	ASP	2.8
1	A	133	LEU	2.7
1	B	252	GLU	2.7
1	A	101	LEU	2.6
1	B	176	TYR	2.6
1	A	105	PHE	2.6
1	A	219	ILE	2.5
1	B	49	MET	2.4
1	A	108	PHE	2.3
1	B	220	GLU	2.3
1	B	38	ILE	2.3

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
1	B	46	LEU	2.3
1	B	315	ASP	2.2
1	A	144	GLU	2.1
1	B	299	LYS	2.1
1	A	166	ALA	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. 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, 95th 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(Å ²)	Q<0.9
2	CL	A	401	1/1	0.87	0.20	-	89,89,89,89	0
2	CL	B	401	1/1	0.94	0.17	-	92,92,92,92	0

6.5 Other polymers [i](#)

There are no such residues in this entry.