



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 14, 2026 – 01:28 AM UTC

PDB ID : 3FRX / pdb_00003frx
Title : Crystal Structure of the Yeast Orthologue of RACK1, Asc1.
Authors : Coyle, S.M.; Gilbert, W.V.; Doudna, J.A.
Deposited on : 2009-01-08
Resolution : 2.13 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

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>.

The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity	:	4-5-2 with Phenix2.0
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

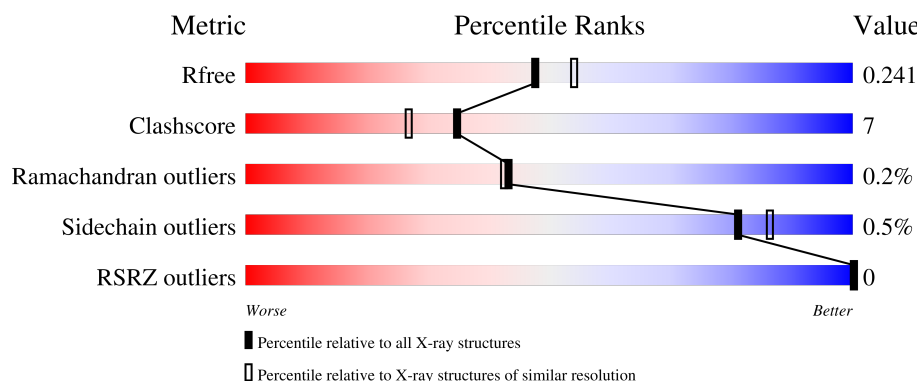
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.13 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}	180053	3689 (2.16-2.12)
Clashscore	190562	3812 (2.16-2.12)
Ramachandran outliers	187476	3773 (2.16-2.12)
Sidechain outliers	187428	3772 (2.16-2.12)
RSRZ outliers	180081	3691 (2.16-2.12)

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 ≥ 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	319	
1	B	319	
1	C	319	
1	D	319	

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 10994 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 Guanine nucleotide-binding protein subunit beta-like protein.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	309	Total	C	N	O	S	Se	0	0	0
			2378	1510	408	452	2	6			
1	B	313	Total	C	N	O	S	Se	0	0	0
			2406	1525	413	459	2	7			
1	C	308	Total	C	N	O	S	Se	0	0	0
			2370	1506	406	450	2	6			
1	D	312	Total	C	N	O	S	Se	0	0	0
			2398	1520	412	458	2	6			

- Molecule 2 is MANGANESE (II) ION (CCD ID: MN) (formula: Mn).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	1	Total	Mn	0	0
			1	1		
2	B	1	Total	Mn	0	0
			1	1		
2	C	1	Total	Mn	0	0
			1	1		
2	D	1	Total	Mn	0	0
			1	1		

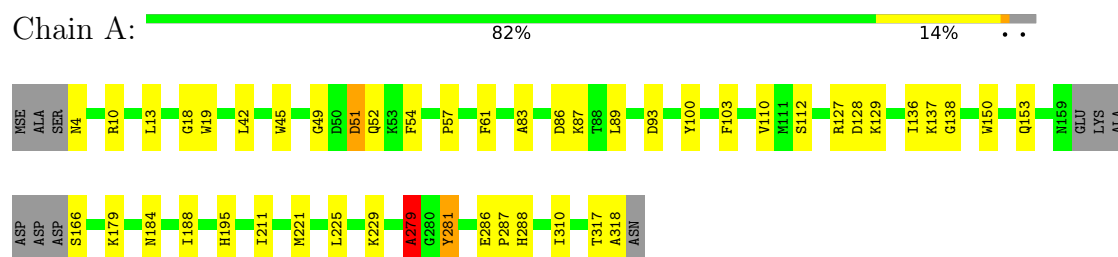
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	367	Total	O	0	0
			367	367		
3	B	361	Total	O	0	0
			361	361		
3	C	343	Total	O	0	0
			343	343		
3	D	367	Total	O	0	0
			367	367		

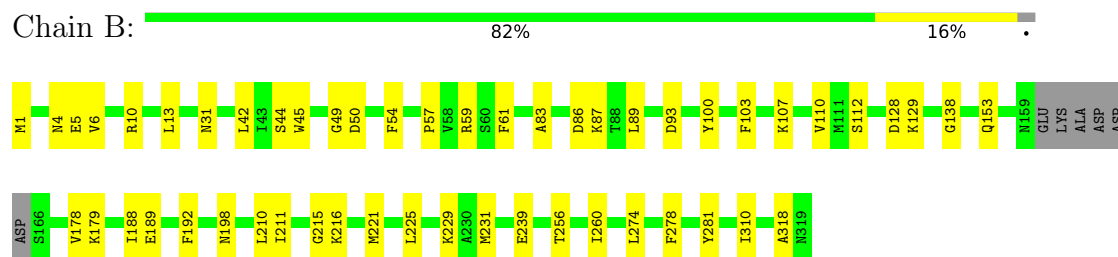
3 Residue-property plots

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.

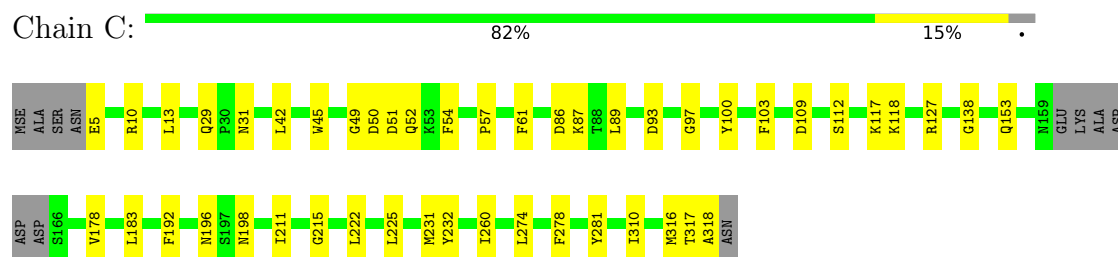
- Molecule 1: Guanine nucleotide-binding protein subunit beta-like protein



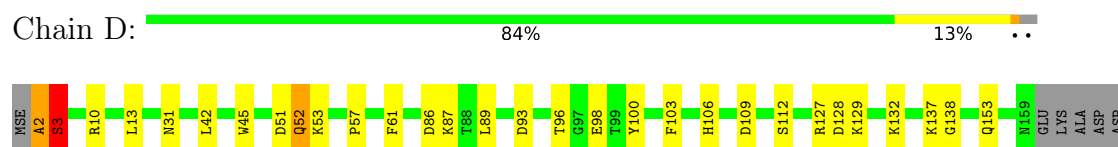
- Molecule 1: Guanine nucleotide-binding protein subunit beta-like protein



- Molecule 1: Guanine nucleotide-binding protein subunit beta-like protein



- Molecule 1: Guanine nucleotide-binding protein subunit beta-like protein



ASP	S166	L183	N184	L210	I211	L225	K229	K230	M231	Y250	L265	D266	P267	K283	I310	K319
-----	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------

4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	168.66Å 85.41Å 119.10Å 90.00° 134.80° 90.00°	Depositor
Resolution (Å)	17.52 – 2.13 17.52 – 2.13	Depositor EDS
% Data completeness (in resolution range)	95.0 (17.52-2.13) 98.5 (17.52-2.13)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.25 (at 2.13Å)	Xtriage
Refinement program	PHENIX (phenix.refine)	Depositor
R, R_{free}	0.195 , 0.239 0.197 , 0.241	Depositor DCC
R_{free} test set	2010 reflections (3.00%)	wwPDB-VP
Wilson B-factor (Å ²)	20.3	Xtriage
Anisotropy	0.356	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.33 , 38.2	EDS
L-test for twinning ²	$\langle L \rangle = 0.47$, $\langle L^2 \rangle = 0.30$	Xtriage
Estimated twinning fraction	0.096 for h+2*k,-h-l 0.000 for h,-k,-h-l 0.000 for -h-2*k,-k,l	Xtriage
F_o, F_c correlation	0.97	EDS
Total number of atoms	10994	wwPDB-VP
Average B, all atoms (Å ²)	26.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 41.30 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 2.4096e-04. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

¹Intensities estimated from amplitudes.

²Theoretical 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](#)

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

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	0.30	1/2424 (0.0%)	0.69	4/3288 (0.1%)
1	B	0.26	0/2452	0.65	0/3324
1	C	0.26	0/2416	0.66	0/3277
1	D	0.26	0/2444	0.67	0/3314
All	All	0.27	1/9736 (0.0%)	0.67	4/13203 (0.0%)

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
1	B	0	1
1	C	0	1
1	D	0	1
All	All	0	4

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	288	HIS	ND1-CE1	5.27	1.37	1.32

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	288	HIS	CB-CG-CD2	-6.51	122.74	131.20
1	A	288	HIS	CB-CG-ND1	5.63	131.14	122.70
1	A	51	ASP	CB-CA-C	-5.46	109.81	117.23
1	A	279	ALA	CB-CA-C	-5.24	110.51	116.54

There are no chirality outliers.

All (4) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	279	ALA	Peptide
1	B	50	ASP	Peptide
1	C	52	GLN	Peptide
1	D	2	ALA	Peptide

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	2378	0	2348	31	0
1	B	2406	0	2376	37	0
1	C	2370	0	2342	41	0
1	D	2398	0	2364	33	0
2	A	1	0	0	0	0
2	B	1	0	0	0	0
2	C	1	0	0	0	0
2	D	1	0	0	0	0
3	A	367	0	0	3	0
3	B	361	0	0	9	0
3	C	343	0	0	15	0
3	D	367	0	0	5	0
All	All	10994	0	9430	142	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 7.

The worst 5 of 142 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:C:118:LYS:HE2	3:C:1435:HOH:O	1.39	1.21
1:C:317:THR:HA	1:C:318:ALA:HB2	1.34	1.06
1:B:239:GLU:HG2	3:B:1240:HOH:O	1.57	1.04
1:C:316:MSE:O	3:C:1395:HOH:O	1.85	0.93
1:C:317:THR:CA	1:C:318:ALA:HB2	2.08	0.83

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	305/319 (96%)	290 (95%)	14 (5%)	1 (0%)	36	33
1	B	309/319 (97%)	298 (96%)	11 (4%)	0	100	100
1	C	304/319 (95%)	296 (97%)	8 (3%)	0	100	100
1	D	308/319 (97%)	295 (96%)	12 (4%)	1 (0%)	36	33
All	All	1226/1276 (96%)	1179 (96%)	45 (4%)	2 (0%)	43	42

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	D	3	SER
1	A	281	TYR

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	254/255 (100%)	254 (100%)	0	100	100
1	B	257/255 (101%)	256 (100%)	1 (0%)	84	88
1	C	253/255 (99%)	252 (100%)	1 (0%)	84	88
1	D	256/255 (100%)	253 (99%)	3 (1%)	63	69
All	All	1020/1020 (100%)	1015 (100%)	5 (0%)	81	86

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

Mol	Chain	Res	Type
1	B	256	THR
1	C	183	LEU
1	D	3	SER
1	D	52	GLN
1	D	183	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (3) such sidechains are listed below:

Mol	Chain	Res	Type
1	B	4	ASN
1	B	52	GLN
1	B	148	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 oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 4 ligands modelled in this entry, 4 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 [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, 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	303/319 (94%)	-1.78	0 100 100	6, 19, 60, 149	0
1	B	306/319 (95%)	-1.77	0 100 100	11, 21, 55, 140	0
1	C	302/319 (94%)	-1.76	0 100 100	8, 20, 54, 121	0
1	D	306/319 (95%)	-1.76	0 100 100	12, 22, 55, 150	0
All	All	1217/1276 (95%)	-1.77	0 100 100	6, 21, 60, 150	0

There are no RSRZ outliers to report.

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 oligosaccharides 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. 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	B-factors(Å ²)	Q<0.9
2	MN	A	1138	1/1	1.00	0.01	34,34,34,34	0
2	MN	B	1139	1/1	1.00	0.01	45,45,45,45	0
2	MN	C	1140	1/1	1.00	0.00	25,25,25,25	0
2	MN	D	1141	1/1	1.00	0.01	57,57,57,57	0

6.5 Other polymers [i](#)

There are no such residues in this entry.