



# wwPDB X-ray Structure Validation Summary Report ⓘ

Jan 31, 2016 – 10:13 PM GMT

PDB ID : 1SMQ  
Title : Structure of the Ribonucleotide Reductase Rnr2 Homodimer from *Saccharomyces cerevisiae*  
Authors : Sommerhalter, M.; Voegtli, W.C.; Perlstein, D.L.; Ge, J.; Stubbe, J.; Rosenzweig, A.C.  
Deposited on : 2004-03-09  
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) : **NOT EXECUTED**  
EDS : **NOT EXECUTED**  
Percentile statistics : 20151230.v01 (using entries in the PDB archive December 30th 2015)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : trunk26865

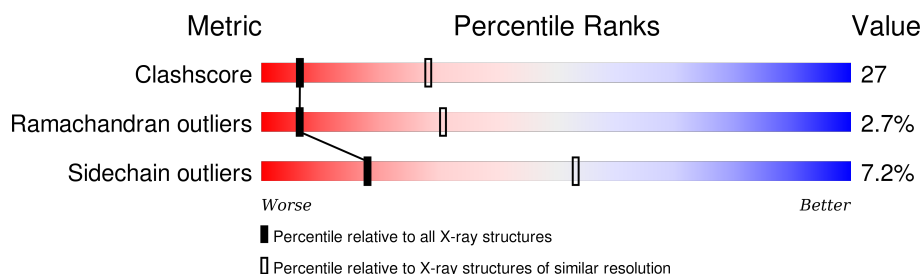
# 1 Overall quality at a glance

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))
Clashscore	102246	1222 (3.14-3.06)
Ramachandran outliers	100387	1174 (3.14-3.06)
Sidechain outliers	100360	1174 (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.

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	399	 43% 36% • • 18%
1	B	399	 43% 34% 5% • 18%
1	C	399	 40% 35% • • 20%
1	D	399	 40% 35% • • 20%

## 2 Entry composition

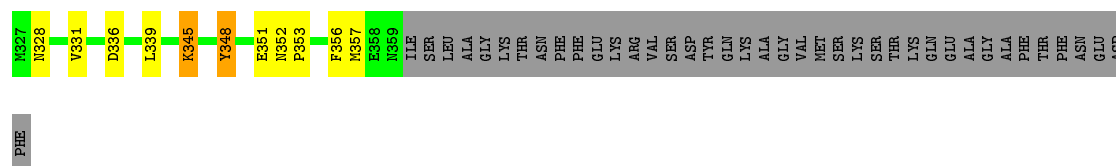
There is only 1 type of molecule in this entry. The entry contains 10690 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 Ribonucleoside-diphosphate reductase small chain 1.

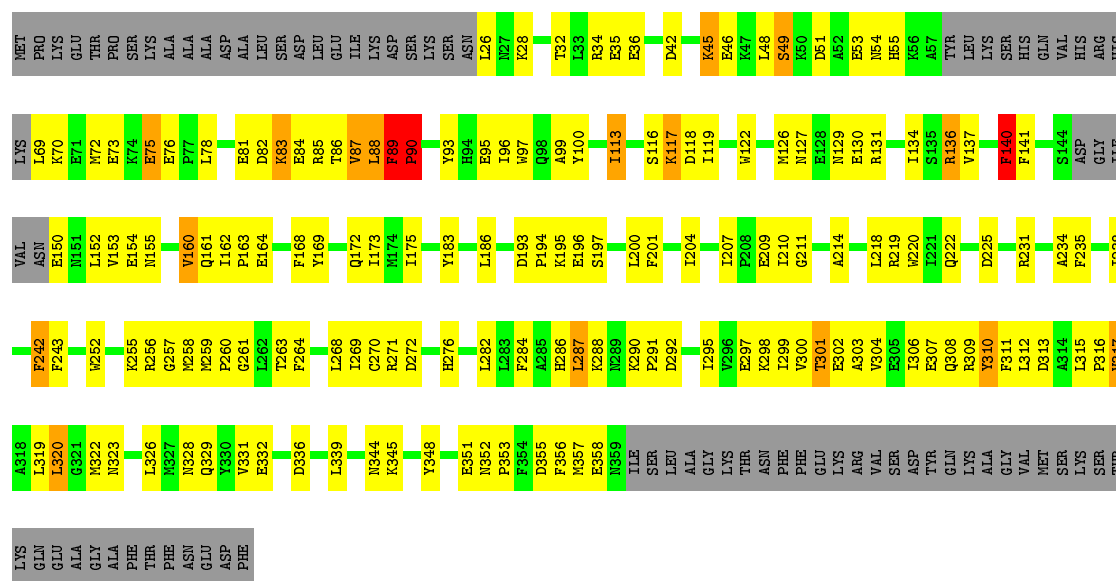
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	329	Total	C	N	O	S	0	0	0
			2723	1757	449	506	11			
1	B	329	Total	C	N	O	S	0	0	0
			2723	1757	449	506	11			
1	C	318	Total	C	N	O	S	0	0	0
			2622	1693	426	492	11			
1	D	318	Total	C	N	O	S	0	0	0
			2622	1693	426	492	11			





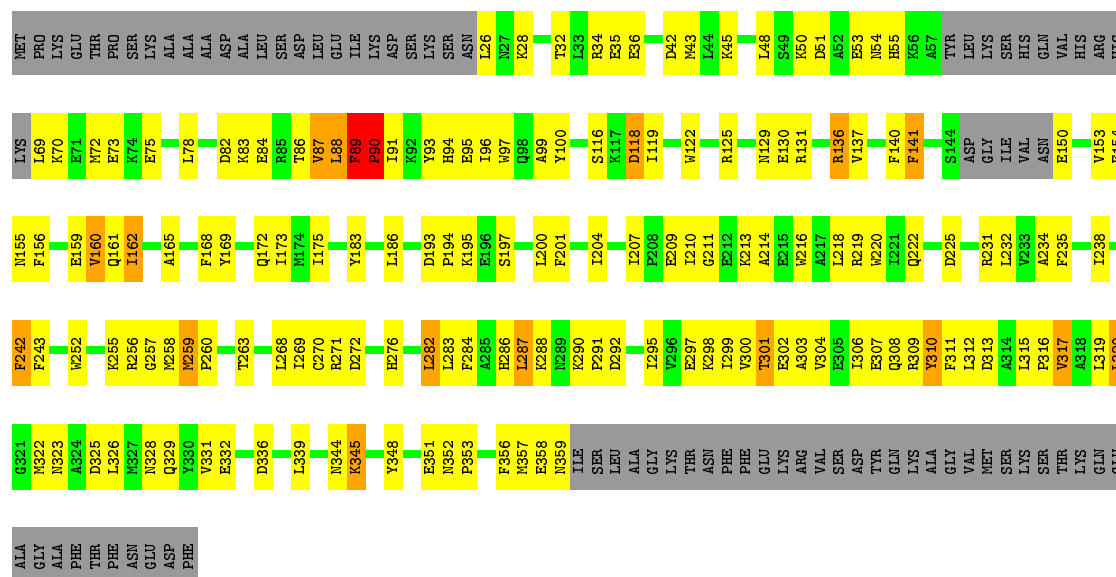
• Molecule 1: Ribonucleoside-diphosphate reductase small chain 1

Chain C: 40% 35% 20%



• Molecule 1: Ribonucleoside-diphosphate reductase small chain 1

Chain D: 40% 35% 20%



## 4 Data and refinement statistics

Xtriage (Phenix) and EDS were not executed - this section will therefore be incomplete.

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	79.67Å 79.57Å 88.05Å 83.47° 83.45° 70.79°	Depositor
Resolution (Å)	25.00 – 3.10	Depositor
% Data completeness (in resolution range)	(Not available) (25.00-3.10)	Depositor
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	0.06	Depositor
Refinement program	CNS	Depositor
R, $R_{free}$	0.272 , 0.303	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	10690	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	70.0	wwPDB-VP

## 5 Model quality

### 5.1 Standard geometry

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	0.52	1/2788 (0.0%)	0.79	9/3759 (0.2%)
1	B	0.53	1/2788 (0.0%)	0.81	6/3759 (0.2%)
1	C	0.47	0/2682	0.79	6/3616 (0.2%)
1	D	0.49	0/2682	0.80	6/3616 (0.2%)
All	All	0.50	2/10940 (0.0%)	0.80	27/14750 (0.2%)

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	2
1	B	0	3
1	C	0	3
1	D	0	1
All	All	0	9

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	133	PHE	CD2-CE2	-7.09	1.25	1.39
1	B	89	PHE	C-N	5.18	1.44	1.34

The worst 5 of 27 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	133	PHE	CB-CG-CD1	11.20	128.64	120.80
1	D	89	PHE	C-N-CD	9.51	148.38	128.40
1	A	89	PHE	C-N-CD	9.34	148.01	128.40
1	B	348	TYR	CB-CG-CD1	9.18	126.51	121.00
1	C	89	PHE	C-N-CD	9.09	147.48	128.40

There are no chirality outliers.

5 of 9 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	133	PHE	Sidechain
1	A	49	SER	Mainchain
1	B	348	TYR	Sidechain
1	B	49	SER	Mainchain
1	B	89	PHE	Mainchain

## 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	2723	0	2660	156	3
1	B	2723	0	2660	138	0
1	C	2622	0	2557	151	3
1	D	2622	0	2557	141	0
All	All	10690	0	10434	579	3

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 27.

The worst 5 of 579 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:D:153:VAL:HG22	1:D:173:ILE:HD13	1.15	1.13
1:B:153:VAL:HG22	1:B:173:ILE:HD13	1.32	1.11
1:A:153:VAL:HG22	1:A:173:ILE:HD13	1.24	1.10
1:C:153:VAL:HG22	1:C:173:ILE:HD13	1.13	1.10
1:A:292:ASP:HB3	1:A:295:ILE:HD13	1.37	1.05

All (3) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:198:GLU:CD	1:C:95:GLU:OE2[1_445]	1.41	0.79

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:198:GLU:OE1	1:C:95:GLU:OE2[1_445]	1.46	0.74
1:A:198:GLU:OE2	1:C:95:GLU:OE2[1_445]	1.82	0.38

## 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	325/399 (82%)	277 (85%)	40 (12%)	8 (2%)	7	32
1	B	325/399 (82%)	275 (85%)	41 (13%)	9 (3%)	6	30
1	C	312/399 (78%)	265 (85%)	38 (12%)	9 (3%)	6	29
1	D	312/399 (78%)	267 (86%)	36 (12%)	9 (3%)	6	29
All	All	1274/1596 (80%)	1084 (85%)	155 (12%)	35 (3%)	6	31

5 of 35 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	90	PRO
1	D	90	PRO
1	A	83	LYS
1	A	89	PHE
1	A	90	PRO

### 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	292/350 (83%)	273 (94%)	19 (6%)	21	57
1	B	292/350 (83%)	271 (93%)	21 (7%)	18	53
1	C	281/350 (80%)	258 (92%)	23 (8%)	14	47
1	D	281/350 (80%)	261 (93%)	20 (7%)	18	54
All	All	1146/1400 (82%)	1063 (93%)	83 (7%)	18	53

5 of 83 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	336	ASP
1	C	89	PHE
1	D	301	THR
1	B	339	LEU
1	C	49	SER

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 37 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	177	ASN
1	C	151	ASN
1	D	202	ASN
1	B	202	ASN
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 ⓘ

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 [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 ⓘ

### 6.1 Protein, DNA and RNA chains ⓘ

EDS was not executed - this section will therefore be empty.

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

EDS was not executed - this section will therefore be empty.

### 6.3 Carbohydrates ⓘ

EDS was not executed - this section will therefore be empty.

### 6.4 Ligands ⓘ

EDS was not executed - this section will therefore be empty.

### 6.5 Other polymers ⓘ

EDS was not executed - this section will therefore be empty.