



# wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 18, 2026 – 05:56 AM UTC

PDB ID : 2OCY / pdb\_00002ocy  
Title : Complex of the guanine exchange factor Sec2p and the Rab GTPase Sec4p  
Authors : Reinisch, K.M.; Dong, G.  
Deposited on : 2006-12-21  
Resolution : 3.30 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

<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>.

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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

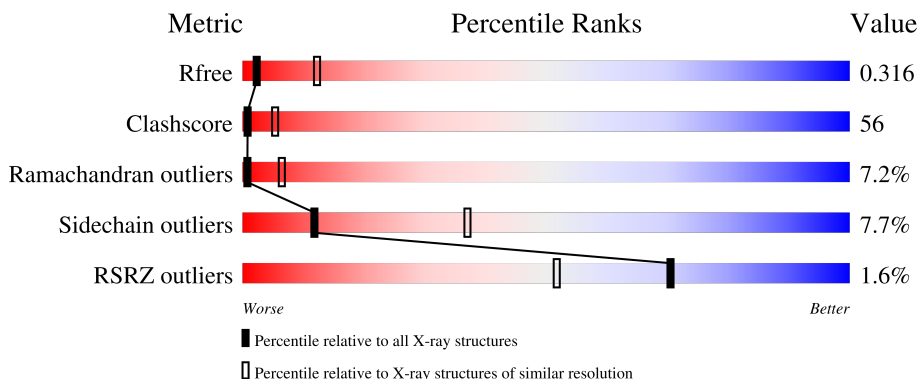
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 3.30 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	1169 (3.32-3.28)
Clashscore	190562	1209 (3.32-3.28)
Ramachandran outliers	187476	1188 (3.32-3.28)
Sidechain outliers	187428	1187 (3.32-3.28)
RSRZ outliers	180081	1169 (3.32-3.28)

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 of the lower bar indicate the fraction of residues that contain outliers for  $\geq 3$ , 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	154	
1	B	154	
2	C	170	

## 2 Entry composition [i](#)

There are 2 unique types of molecules in this entry. The entry contains 3592 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 Rab guanine nucleotide exchange factor SEC2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	Se			
1	A	149	1212	744	212	253	3	27	0	0
1	B	149	1212	744	212	253	3	9	0	0

There are 10 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	14	SER	-	cloning artifact	UNP P17065
A	15	MSE	-	cloning artifact	UNP P17065
A	16	ALA	-	cloning artifact	UNP P17065
A	115	MSE	MET	modified residue	UNP P17065
A	158	MSE	MET	modified residue	UNP P17065
B	14	SER	-	cloning artifact	UNP P17065
B	15	MSE	-	cloning artifact	UNP P17065
B	16	ALA	-	cloning artifact	UNP P17065
B	115	MSE	MET	modified residue	UNP P17065
B	158	MSE	MET	modified residue	UNP P17065

- Molecule 2 is a protein called Ras-related protein SEC4.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace	
			Total	C	N	O	S				Se
2	C	147	1168	753	189	223	1	2	79	0	0

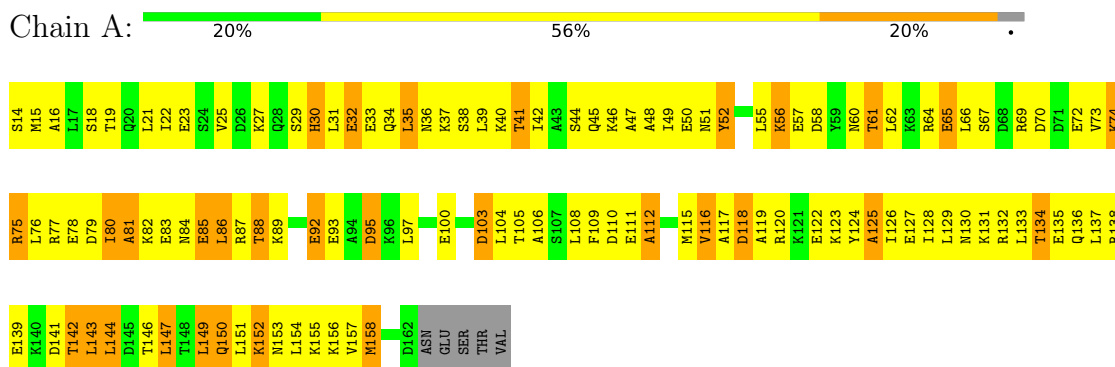
There are 3 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
C	21	MSE	MET	modified residue	UNP P07560
C	94	MSE	MET	modified residue	UNP P07560
C	137	MSE	MET	modified residue	UNP P07560

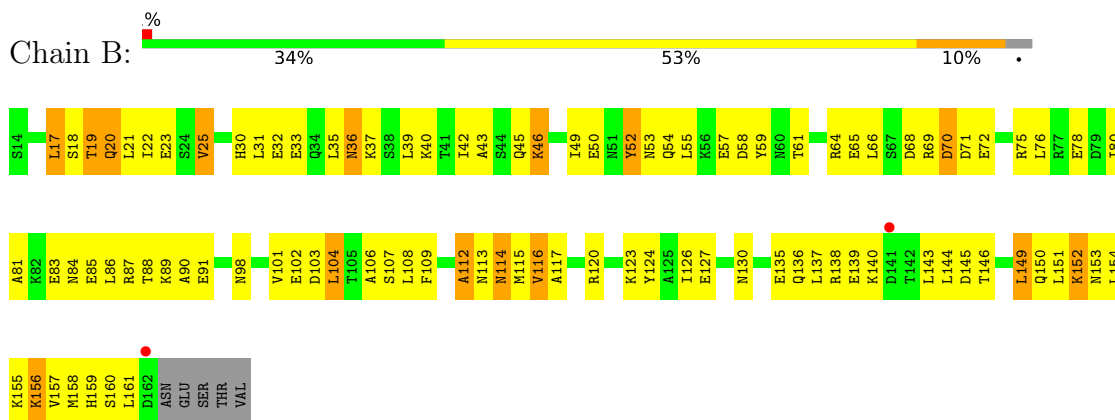
### 3 Residue-property plots [i](#)

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.

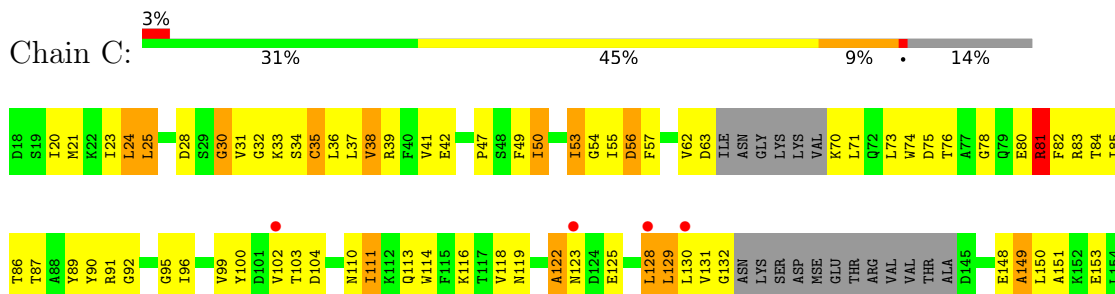
- Molecule 1: Rab guanine nucleotide exchange factor SEC2



- Molecule 1: Rab guanine nucleotide exchange factor SEC2



- Molecule 2: Ras-related protein SEC4



G155	I156	P157	F158	I159	E160	S161	S162	A163	LYS	ASN	ASN	ASP	ASP	M168	V169	I172	F173	F174	I175	L176	A177	K178	L179	I180	Q181	E182	K183	I184	D185	S186	ASN
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## 4 Data and refinement statistics

Property	Value	Source
Space group	P 61 2 2	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	93.00Å 93.00Å 295.91Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	20.00 – 3.30 20.00 – 3.31	Depositor EDS
% Data completeness (in resolution range)	97.7 (20.00-3.30) 97.8 (20.00-3.31)	Depositor EDS
$R_{merge}$	0.08	Depositor
$R_{sym}$	0.08	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	4.00 (at 3.32Å)	Xtrriage
Refinement program	CNS 1.1	Depositor
R, $R_{free}$	0.250 , 0.325 0.246 , 0.316	Depositor DCC
$R_{free}$ test set	1124 reflections (9.46%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	101.8	Xtrriage
Anisotropy	0.366	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.28 , 127.8	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.45$ , $\langle L^2 \rangle = 0.27$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.94	EDS
Total number of atoms	3592	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	91.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.86% 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, 0.333 respectively for untwinned datasets, and 0.375, 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	0.54	0/1214	1.02	12/1620 (0.7%)
1	B	0.52	0/1214	1.00	7/1620 (0.4%)
2	C	0.41	0/1182	0.96	4/1588 (0.3%)
All	All	0.50	0/3610	0.99	23/4828 (0.5%)

There are no bond length outliers.

The worst 5 of 23 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed( $^{\circ}$ )	Ideal( $^{\circ}$ )
1	B	52	TYR	N-CA-C	-8.45	102.78	113.43
1	B	25	VAL	N-CA-C	-8.44	105.69	113.71
1	A	52	TYR	N-CA-C	-7.94	102.23	112.23
1	A	93	GLU	N-CA-C	-7.83	102.36	112.23
1	A	32	GLU	N-CA-C	-7.64	102.95	111.28

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	1212	0	1234	176	0
1	B	1212	0	1234	129	0
2	C	1168	0	1178	143	0
All	All	3592	0	3646	393	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 56.

The worst 5 of 393 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:55:LEU:HD23	1:B:55:LEU:HD23	1.25	1.16
2:C:100:TYR:HB3	2:C:111:ILE:HD11	1.33	1.08
2:C:76:THR:HG22	2:C:78:GLY:H	1.25	0.99
1:A:149:LEU:HD23	1:A:150:GLN:N	1.87	0.89
2:C:159:ILE:HG22	2:C:160:GLU:H	1.35	0.89

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	147/154 (96%)	91 (62%)	44 (30%)	12 (8%)	0	5
1	B	147/154 (96%)	108 (74%)	31 (21%)	8 (5%)	1	10
2	C	139/170 (82%)	103 (74%)	25 (18%)	11 (8%)	1	5
All	All	433/478 (91%)	302 (70%)	100 (23%)	31 (7%)	1	6

5 of 31 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	152	LYS
2	C	81	ARG
2	C	162	SER
1	A	41	THR
1	A	118	ASP

### 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	137/139 (99%)	123 (90%)	14 (10%)	7	26
1	B	137/139 (99%)	129 (94%)	8 (6%)	18	47
2	C	128/146 (88%)	119 (93%)	9 (7%)	14	41
All	All	402/424 (95%)	371 (92%)	31 (8%)	12	37

5 of 31 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	17	LEU
2	C	81	ARG
1	B	36	ASN
2	C	129	LEU
2	C	42	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 12 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	113	ASN
1	B	150	GLN
2	C	181	GLN
2	C	119	ASN
1	A	113	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](#)

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	146/154 (94%)	-0.43	0 <b>100</b> <b>100</b>	26, 74, 126, 173	9 (6%)
1	B	146/154 (94%)	-0.43	2 (1%) 73 55	23, 69, 117, 145	3 (2%)
2	C	145/170 (85%)	0.18	5 (3%) 48 32	44, 108, 171, 181	18 (12%)
All	All	437/478 (91%)	-0.23	7 (1%) 70 52	23, 78, 163, 181	30 (6%)

The worst 5 of 7 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	162	ASP	2.3
2	C	128	LEU	2.3
2	C	123	ASN	2.2
2	C	130	LEU	2.2
2	C	173	PHE	2.2

### 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](#)

There are no ligands in this entry.

## 6.5 Other polymers [i](#)

There are no such residues in this entry.