



# wwPDB X-ray Structure Validation Summary Report ⓘ

May 22, 2020 – 06:07 pm BST

PDB ID : 5OOQ  
Title : Structure of the Mtr4 Nop53 Complex  
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Deposited on : 2017-08-08  
Resolution : 3.20 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.

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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 : 1.8.5 (274361), CSD as541be (2020)  
Xtriage (Phenix) : 1.13  
EDS : 2.11  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
Refmac : 5.8.0158  
CCP4 : 7.0.044 (Gargrove)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.11

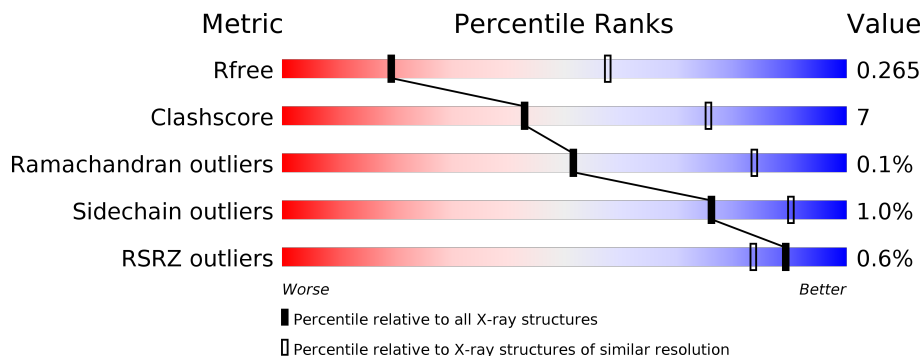
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 3.20 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))
$R_{free}$	130704	1133 (3.20-3.20)
Clashscore	141614	1253 (3.20-3.20)
Ramachandran outliers	138981	1234 (3.20-3.20)
Sidechain outliers	138945	1233 (3.20-3.20)
RSRZ outliers	127900	1095 (3.20-3.20)

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 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	998	
1	B	998	
2	C	38	
2	D	38	

## 2 Entry composition i

There are 4 unique types of molecules in this entry. The entry contains 14049 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 ATP-dependent RNA helicase DOB1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	952	Total	C	N	O	S	0	0	0
			7023	4482	1201	1298	42			
1	B	949	Total	C	N	O	S	0	0	0
			6763	4309	1153	1263	38			

There are 10 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	76	GLY	-	expression tag	UNP P47047
A	77	PRO	-	expression tag	UNP P47047
A	78	ASP	-	expression tag	UNP P47047
A	79	SER	-	expression tag	UNP P47047
A	80	MET	-	expression tag	UNP P47047
B	76	GLY	-	expression tag	UNP P47047
B	77	PRO	-	expression tag	UNP P47047
B	78	ASP	-	expression tag	UNP P47047
B	79	SER	-	expression tag	UNP P47047
B	80	MET	-	expression tag	UNP P47047

- Molecule 2 is a protein called Ribosome biogenesis protein NOP53.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
			Total	C	N	O			
2	C	12	Total	C	N	O	0	0	0
			84	54	14	16			
2	D	14	Total	C	N	O	0	0	0
			85	53	16	16			

There are 10 discrepancies between the modelled and reference sequences:

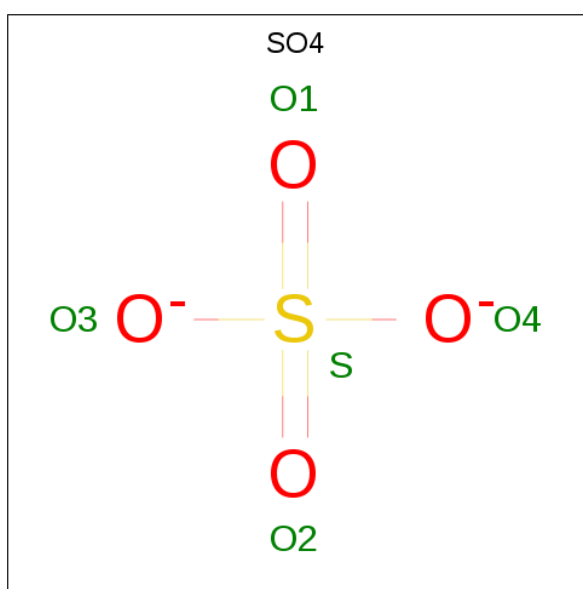
Chain	Residue	Modelled	Actual	Comment	Reference
C	54	GLY	-	expression tag	UNP Q12080
C	55	PRO	-	expression tag	UNP Q12080

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Chain	Residue	Modelled	Actual	Comment	Reference
C	56	ASP	-	expression tag	UNP Q12080
C	57	SER	-	expression tag	UNP Q12080
C	58	MET	-	expression tag	UNP Q12080
D	54	GLY	-	expression tag	UNP Q12080
D	55	PRO	-	expression tag	UNP Q12080
D	56	ASP	-	expression tag	UNP Q12080
D	57	SER	-	expression tag	UNP Q12080
D	58	MET	-	expression tag	UNP Q12080

- Molecule 3 is SULFATE ION (three-letter code: SO4) (formula: O<sub>4</sub>S).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	1	Total O S 5 4 1	0	0
3	A	1	Total O S 5 4 1	0	0
3	A	1	Total O S 5 4 1	0	0
3	B	1	Total O S 5 4 1	0	0
3	B	1	Total O S 5 4 1	0	0

- Molecule 4 is water.

<b>Mol</b>	<b>Chain</b>	<b>Residues</b>	<b>Atoms</b>		<b>ZeroOcc</b>	<b>AltConf</b>
4	A	38	Total 38	O 38	0	0
4	B	31	Total 31	O 31	0	0

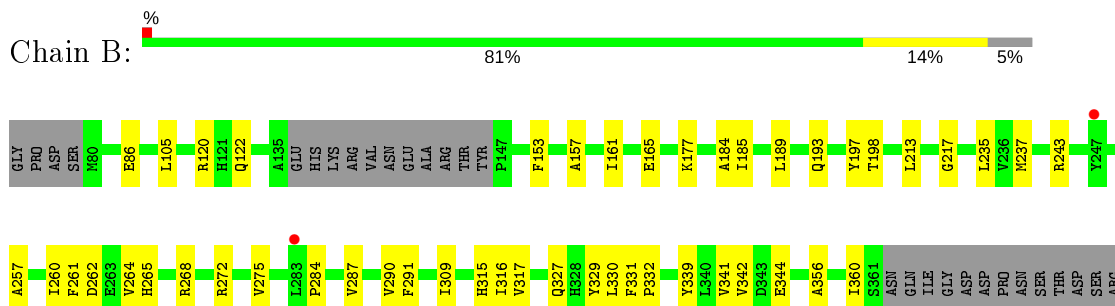
### 3 Residue-property plots [i](#)

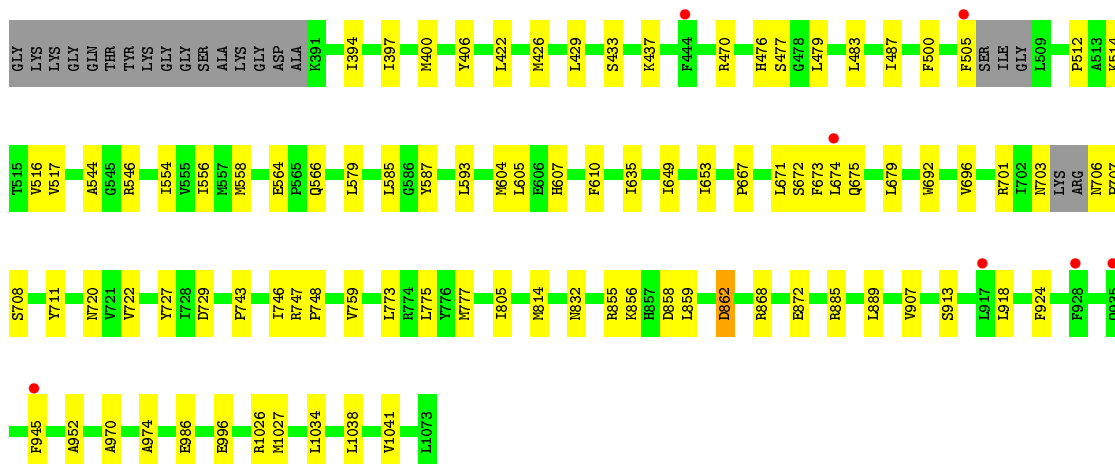
These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are 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: ATP-dependent RNA helicase DOB1

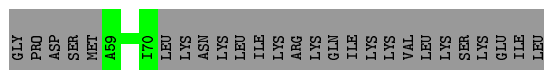


- Molecule 1: ATP-dependent RNA helicase DOB1

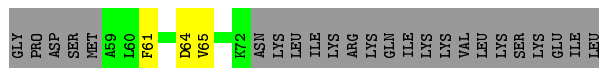




- Molecule 2: Ribosome biogenesis protein NOP53



- Molecule 2: Ribosome biogenesis protein NOP53



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	77.23Å 151.37Å 133.04Å 90.00° 92.72° 90.00°	Depositor
Resolution (Å)	66.50 – 3.20 77.14 – 3.20	Depositor EDS
% Data completeness (in resolution range)	99.3 (66.50-3.20) 99.2 (77.14-3.20)	Depositor EDS
$R_{merge}$	0.12	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.44 (at 3.19Å)	Xtrriage
Refinement program	PHENIX	Depositor
R, $R_{free}$	0.211 , 0.267 0.211 , 0.265	Depositor DCC
$R_{free}$ test set	2458 reflections (4.90%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	110.8	Xtrriage
Anisotropy	0.287	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.28 , 96.2	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.46$ , $\langle L^2 \rangle = 0.29$	Xtrriage
Estimated twinning fraction	0.106 for h,-k,-l	Xtrriage
$F_o, F_c$ correlation	0.95	EDS
Total number of atoms	14049	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	124.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.24% 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](#)

Bond lengths and bond angles in the following residue types are not validated in this section: SO4

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	0.24	0/7161	0.42	0/9744
1	B	0.24	0/6898	0.41	0/9416
2	C	0.30	0/85	0.45	0/115
2	D	0.22	0/86	0.43	0/117
All	All	0.24	0/14230	0.42	0/19392

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 [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	7023	0	6503	101	0
1	B	6763	0	5955	79	0
2	C	84	0	68	0	0
2	D	85	0	52	2	0
3	A	15	0	0	1	0
3	B	10	0	0	1	0
4	A	38	0	0	2	0
4	B	31	0	0	0	0
All	All	14049	0	12578	181	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 181 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:585:LEU:HD21	1:A:605:LEU:HD11	1.69	0.74
1:B:679:LEU:HD11	1:B:775:LEU:HD13	1.72	0.72
1:B:585:LEU:HD21	1:B:605:LEU:HD11	1.73	0.70
1:B:243:ARG:HD2	1:B:275:VAL:HG23	1.75	0.68
1:A:679:LEU:HD11	1:A:775:LEU:HD13	1.75	0.67

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	944/998 (95%)	913 (97%)	29 (3%)	2 (0%)	47	79
1	B	939/998 (94%)	905 (96%)	34 (4%)	0	100	100
2	C	10/38 (26%)	9 (90%)	1 (10%)	0	100	100
2	D	12/38 (32%)	11 (92%)	1 (8%)	0	100	100
All	All	1905/2072 (92%)	1838 (96%)	65 (3%)	2 (0%)	51	83

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	134	ILE
1	A	202	LYS

### 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	668/881 (76%)	661 (99%)	7 (1%)	76	90
1	B	596/881 (68%)	590 (99%)	6 (1%)	76	90
2	C	7/35 (20%)	7 (100%)	0	100	100
2	D	4/35 (11%)	4 (100%)	0	100	100
All	All	1275/1832 (70%)	1262 (99%)	13 (1%)	76	90

5 of 13 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	902	GLU
1	A	1027	MET
1	B	610	PHE
1	A	610	PHE
1	B	505	PHE

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

### 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 carbohydrates in this entry.

## 5.6 Ligand geometry [i](#)

5 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
3	SO4	A	1101	-	4,4,4	0.15	0	6,6,6	0.04	0
3	SO4	A	1102	-	4,4,4	0.14	0	6,6,6	0.06	0
3	SO4	B	1102	1	4,4,4	0.14	0	6,6,6	0.05	0
3	SO4	A	1103	-	4,4,4	0.14	0	6,6,6	0.05	0
3	SO4	B	1101	-	4,4,4	0.14	0	6,6,6	0.06	0

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.

2 monomers are involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	1101	SO4	1	0
3	B	1101	SO4	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	952/998 (95%)	-0.36	2 (0%) 95 94	59, 113, 175, 257	0
1	B	949/998 (95%)	-0.38	9 (0%) 84 75	77, 129, 192, 251	0
2	C	12/38 (31%)	-0.80	0 100 100	143, 164, 180, 206	0
2	D	14/38 (36%)	-0.80	0 100 100	150, 164, 202, 207	0
All	All	1927/2072 (93%)	-0.38	11 (0%) 89 83	59, 123, 186, 257	0

The worst 5 of 11 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	674	LEU	4.6
1	B	928	PHE	3.7
1	B	444	PHE	3.4
1	B	505	PHE	2.8
1	B	945	PHE	2.6

### 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. 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	B-factors( $\text{\AA}^2$ )	Q<0.9
3	SO4	A	1103	5/5	0.78	0.10	198,207,208,214	0
3	SO4	B	1102	5/5	0.83	0.21	178,207,212,213	0
3	SO4	B	1101	5/5	0.89	0.12	134,138,151,164	0
3	SO4	A	1102	5/5	0.92	0.12	129,160,164,169	0
3	SO4	A	1101	5/5	0.97	0.16	102,104,127,139	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.