



# Full wwPDB X-ray Structure Validation Report ⓘ

Oct 9, 2017 – 12:18 PM EDT

PDB ID : 2NRV  
Title : Crystal structure of the C-terminal half of UvrC  
Authors : Karakas, E.; Truglio, J.J.; Kisker, C.  
Deposited on : unknown  
Resolution : 1.80 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](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  
Xtriage (Phenix) : 1.9-1692  
EDS : rb-20030345  
Percentile statistics : 20161228.v01 (using entries in the PDB archive December 28th 2016)  
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) : rb-20030345

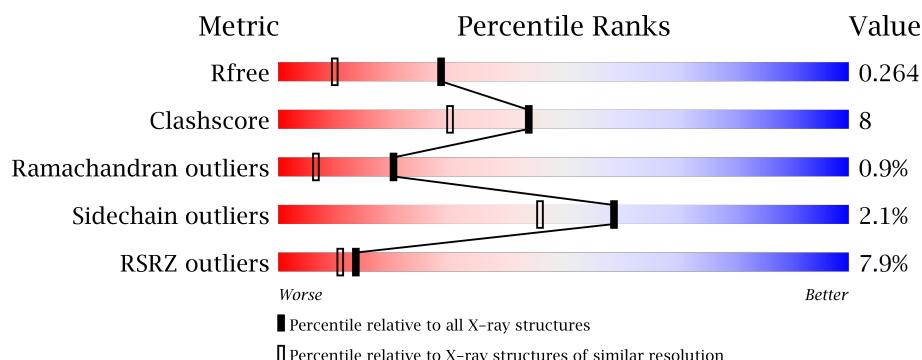
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

## *X-RAY DIFFRACTION*

The reported resolution of this entry is 1.80 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))
$R_{free}$	100719	4827 (1.80-1.80)
Clashscore	112137	5742 (1.80-1.80)
Ramachandran outliers	110173	5676 (1.80-1.80)
Sidechain outliers	110143	5675 (1.80-1.80)
RSRZ outliers	101464	4906 (1.80-1.80)

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.

Mol	Chain	Length	Quality of chain
1	A	220	
1	B	220	

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
2	NA	B	559	-	-	-	X

## 2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 3907 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 UvrABC system protein C.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	218	Total	C	N	O	S	0	0	0
			1774	1125	327	319	3			
1	B	214	Total	C	N	O	S	0	0	0
			1736	1102	319	312	3			

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	558	GLY	-	CLONING ARTIFACT	UNP Q9WYA3
B	558	GLY	-	CLONING ARTIFACT	UNP Q9WYA3

- Molecule 2 is SODIUM ION (three-letter code: NA) (formula: Na).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	B	1	Total	Na	0	0
			1	1		

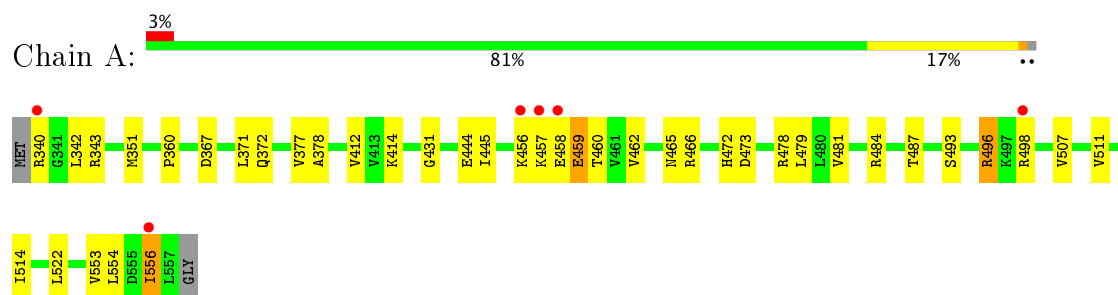
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	188	Total	O	0	0
			188	188		
3	B	208	Total	O	0	0
			208	208		

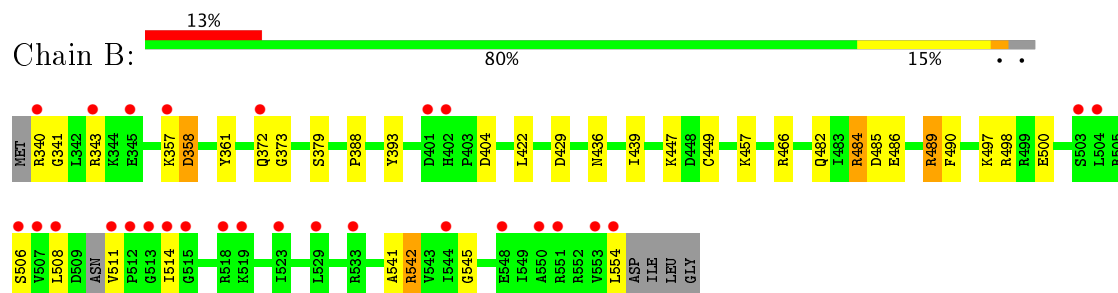
### 3 Residue-property plots [i](#)

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: UvrABC system protein C



#### • Molecule 1: UvrABC system protein C



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	35.50 Å 94.63 Å 132.35 Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	40.00 – 1.80 32.27 – 1.80	Depositor EDS
% Data completeness (in resolution range)	99.4 (40.00-1.80) 99.4 (32.27-1.80)	Depositor EDS
$R_{merge}$	0.04	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	4.11 (at 1.80 Å)	Xtriage
Refinement program	REFMAC 5.2.0005	Depositor
R, $R_{free}$	0.185 , 0.251 0.197 , 0.264	Depositor DCC
$R_{free}$ test set	2186 reflections (5.47%)	DCC
Wilson B-factor (Å <sup>2</sup> )	25.7	Xtriage
Anisotropy	0.075	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.38 , 55.6	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
$F_o, F_c$ correlation	0.95	EDS
Total number of atoms	3907	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	31.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.88% 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: NA

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	0.77	0/1806	0.80	1/2428 (0.0%)
1	B	0.81	0/1767	0.91	7/2374 (0.3%)
All	All	0.79	0/3573	0.85	8/4802 (0.2%)

There are no bond length outliers.

All (8) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	489	ARG	NE-CZ-NH1	10.82	125.71	120.30
1	B	484	ARG	NE-CZ-NH2	-7.67	116.47	120.30
1	B	489	ARG	NE-CZ-NH2	-7.42	116.59	120.30
1	A	484	ARG	NE-CZ-NH2	-7.16	116.72	120.30
1	B	542	ARG	NE-CZ-NH2	-6.66	116.97	120.30
1	B	484	ARG	NE-CZ-NH1	6.07	123.34	120.30
1	B	485	ASP	CB-CG-OD1	5.43	123.19	118.30
1	B	542	ARG	NE-CZ-NH1	5.02	122.81	120.30

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	1774	0	1829	29	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	B	1736	0	1785	27	1
2	B	1	0	0	0	0
3	A	188	0	0	5	1
3	B	208	0	0	13	0
All	All	3907	0	3614	54	1

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 8.

All (54) 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:511:VAL:HG13	3:B:756:HOH:O	1.52	1.05
1:A:414:LYS:HZ2	1:A:445:ILE:HG23	1.44	0.80
1:B:482:GLN:OE1	3:B:763:HOH:O	2.02	0.77
1:A:367:ASP:HB2	1:A:487:THR:HG22	1.68	0.75
1:A:414:LYS:NZ	1:A:445:ILE:HG23	2.05	0.72
1:A:553:VAL:O	1:A:556:ILE:HG22	1.94	0.68
1:A:458:GLU:O	1:A:460:THR:N	2.26	0.67
1:B:542:ARG:NH2	3:B:729:HOH:O	2.31	0.64
1:A:466:ARG:NH1	3:A:740:HOH:O	2.30	0.63
1:B:404:ASP:HA	3:B:651:HOH:O	2.00	0.62
1:B:357:LYS:O	1:B:358:ASP:HB2	1.99	0.61
1:A:459:GLU:OE1	1:A:478:ARG:NH2	2.34	0.61
1:B:439:ILE:CD1	3:B:602:HOH:O	2.48	0.61
1:A:414:LYS:HZ2	1:A:445:ILE:CG2	2.15	0.56
1:B:429:ASP:HB2	3:B:737:HOH:O	2.06	0.56
1:A:498:ARG:NH2	3:A:706:HOH:O	2.38	0.56
1:B:357:LYS:O	1:B:358:ASP:CB	2.55	0.54
1:B:541:ALA:O	1:B:545:GLY:N	2.41	0.53
1:A:340:ARG:HA	3:A:741:HOH:O	2.09	0.52
1:A:371:LEU:HD13	1:A:377:VAL:HG23	1.93	0.51
1:B:466:ARG:NE	3:B:748:HOH:O	2.44	0.50
1:A:498:ARG:HD2	3:A:730:HOH:O	2.11	0.50
1:A:511:VAL:CG2	1:A:556:ILE:HG21	2.42	0.49
1:A:372:GLN:HG2	1:B:457:LYS:HG3	1.95	0.49
1:B:486:GLU:OE1	1:B:489:ARG:HD2	2.13	0.48
1:B:484:ARG:HD3	3:B:584:HOH:O	2.13	0.48
1:A:431:GLY:HA2	1:A:462:VAL:HG21	1.95	0.48
1:A:511:VAL:HG22	1:A:556:ILE:HG21	1.95	0.48
1:A:493:SER:O	1:A:496:ARG:HG2	2.13	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:514:ILE:HG23	1:B:514:ILE:O	2.13	0.47
1:A:507:VAL:CG1	1:A:556:ILE:HD13	2.45	0.47
1:A:342:LEU:HB3	1:A:479:LEU:CD2	2.45	0.46
1:B:497:LYS:HG3	3:B:609:HOH:O	2.17	0.45
1:B:340:ARG:HG3	1:B:341:GLY:H	1.81	0.45
1:B:508:LEU:O	1:B:511:VAL:HB	2.17	0.45
1:A:367:ASP:CB	1:A:487:THR:HG22	2.42	0.44
1:B:343:ARG:HG2	3:B:647:HOH:O	2.16	0.44
1:B:372:GLN:HA	1:B:373:GLY:HA2	1.76	0.44
1:B:506:SER:HA	3:B:653:HOH:O	2.18	0.44
1:B:379:SER:HB3	1:B:490:PHE:CD2	2.53	0.43
1:A:514:ILE:HD11	1:A:522:LEU:HD12	2.01	0.43
1:B:436:ASN:ND2	3:B:627:HOH:O	2.48	0.42
1:A:414:LYS:HE2	1:A:444:GLU:OE2	2.19	0.42
1:A:414:LYS:HZ3	1:A:444:GLU:HB3	1.85	0.42
1:B:500:GLU:OE1	1:B:500:GLU:HA	2.18	0.42
1:B:498:ARG:NH2	3:B:753:HOH:O	2.52	0.42
1:B:422:LEU:HD11	1:B:447:LYS:HB3	2.01	0.42
1:A:351:MET:HG3	1:A:360:PRO:HD3	2.02	0.41
1:A:372:GLN:HG3	1:B:457:LYS:HE2	2.03	0.41
1:A:378:ALA:CB	1:A:412:VAL:HG21	2.50	0.41
1:A:465:ASN:HB2	3:A:719:HOH:O	2.19	0.41
1:B:388:PRO:HB3	1:B:393:TYR:OH	2.21	0.41
1:A:459:GLU:CD	1:A:478:ARG:NH2	2.75	0.40
1:A:478:ARG:NH2	1:A:481:VAL:HG21	2.37	0.40

All (1) 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:B:361:TYR:OH	3:A:741:HOH:O[2_655]	2.17	0.03

## 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	216/220 (98%)	209 (97%)	4 (2%)	3 (1%)	13	3
1	B	210/220 (96%)	202 (96%)	7 (3%)	1 (0%)	32	17
All	All	426/440 (97%)	411 (96%)	11 (3%)	4 (1%)	20	6

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	459	GLU
1	B	358	ASP
1	A	456	LYS
1	A	457	LYS

### 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	194/195 (100%)	188 (97%)	6 (3%)	45	29
1	B	189/195 (97%)	187 (99%)	2 (1%)	78	72
All	All	383/390 (98%)	375 (98%)	8 (2%)	59	46

All (8) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	343	ARG
1	A	472	HIS
1	A	473	ASP
1	A	496	ARG
1	A	554	LEU
1	A	556	ILE
1	B	449	CYS
1	B	554	LEU

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such sidechains are listed below:

Mol	Chain	Res	Type
1	B	400	GLN

### 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](#)

Of 1 ligands modelled in this entry, 1 is 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, 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	218/220 (99%)	0.06	6 (2%) 53 48	17, 28, 41, 60	0
1	B	214/220 (97%)	0.53	28 (13%) 4 3	15, 28, 46, 59	0
All	All	432/440 (98%)	0.29	34 (7%) 13 11	15, 28, 44, 60	0

All (34) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	511	VAL	6.6
1	B	508	LEU	6.0
1	B	514	ILE	5.9
1	A	457	LYS	5.0
1	B	506	SER	5.0
1	B	507	VAL	4.7
1	B	513	GLY	4.7
1	B	401	ASP	3.7
1	B	512	PRO	3.4
1	B	553	VAL	3.3
1	B	518	ARG	3.2
1	B	529	LEU	3.1
1	A	340	ARG	3.1
1	B	357	LYS	3.1
1	B	533	ARG	2.9
1	B	554	LEU	2.8
1	B	550	ALA	2.8
1	B	402	HIS	2.8
1	B	551	ARG	2.7
1	B	340	ARG	2.7
1	B	343	ARG	2.7
1	B	548	GLU	2.6
1	B	504	LEU	2.5
1	B	519	LYS	2.5

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Mol	Chain	Res	Type	RSRZ
1	A	498	ARG	2.5
1	B	345	GLU	2.4
1	A	458	GLU	2.3
1	A	556	ILE	2.2
1	A	456	LYS	2.2
1	B	372	GLN	2.2
1	B	503	SER	2.1
1	B	523	ILE	2.0
1	B	544	ILE	2.0
1	B	515	GLY	2.0

## 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, 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	LLDF	B-factors( $\text{\AA}^2$ )	Q<0.9
2	NA	B	559	1/1	0.99	0.14	2.29	27,27,27,27	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.