



# Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 08:13 PM UTC

PDB ID : 5WIG / pdb\_00005wig  
Title : Structure of New Delhi Metallo-Beta-lactamase 4 (NDM-4)  
Authors : VanPelt, J.; Williams, C.; Page, R.C.  
Deposited on : 2017-07-19  
Resolution : 1.40 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

<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
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

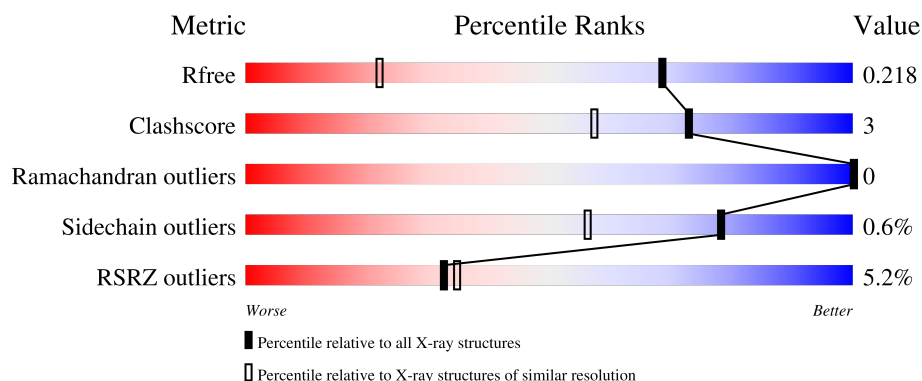
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.40 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	2563 (1.40-1.40)
Clashscore	190562	2660 (1.40-1.40)
Ramachandran outliers	187476	2611 (1.40-1.40)
Sidechain outliers	187428	2610 (1.40-1.40)
RSRZ outliers	180081	2561 (1.40-1.40)

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	230	<div> <div>8%</div> <div> <div></div> <div>92%</div> <div>7%</div> </div> </div>
1	B	230	<div> <div>3%</div> <div> <div></div> <div>89%</div> <div>10%</div> </div> </div>

## 2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 4063 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 NDM-4.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	229	Total	C	N	O	S	0	4	0
			1717	1078	305	327	7			
1	B	229	Total	C	N	O	S	0	7	0
			1735	1092	305	328	10			

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	41	MET	-	initiating methionine	UNP A0A0G2ST15
B	41	MET	-	initiating methionine	UNP A0A0G2ST15

- Molecule 2 is ZINC ION (CCD ID: ZN) (formula: Zn) (labeled as "Ligand of Interest" by depositor).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	2	Total	Zn	0	0
			2	2		
2	B	2	Total	Zn	0	0
			2	2		

- Molecule 3 is water.

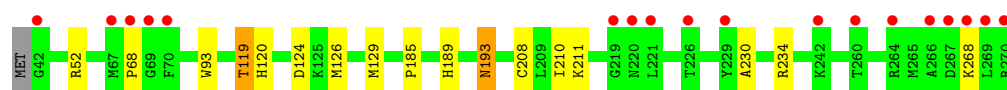
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	309	Total	O	0	0
			309	309		
3	B	298	Total	O	0	0
			298	298		

### 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: NDM-4

Chain A: 



- Molecule 1: NDM-4

Chain B: 



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	41.41Å 59.15Å 84.50Å 90.00° 98.70° 90.00°	Depositor
Resolution (Å)	39.18 – 1.40 39.18 – 1.40	Depositor EDS
% Data completeness (in resolution range)	97.5 (39.18-1.40) 83.5 (39.18-1.40)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	0.50 (at 1.40Å)	Xtriage
Refinement program	PHENIX 1.9_1692	Depositor
R, $R_{free}$	0.200 , 0.225 0.196 , 0.218	Depositor DCC
$R_{free}$ test set	1996 reflections (2.51%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	9.5	Xtriage
Anisotropy	0.369	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.33 , 45.8	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.48$ , $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
$F_o, F_c$ correlation	0.96	EDS
Total number of atoms	4063	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	21.0	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 88.76 % 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 4.3643e-08. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

<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: ZN

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	0.62	3/1769 (0.2%)	0.70	1/2410 (0.0%)
1	B	0.57	0/1788	0.73	2/2434 (0.1%)
All	All	0.60	3/3557 (0.1%)	0.72	3/4844 (0.1%)

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	185	PRO	C-O	-6.89	1.15	1.24
1	A	68	PRO	C-O	-5.50	1.17	1.23
1	A	52	ARG	C-O	-5.46	1.17	1.24

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	250	HIS	N-CA-C	6.45	120.79	112.41
1	A	119	THR	N-CA-C	5.46	119.92	113.16
1	B	119	THR	N-CA-C	5.22	119.63	113.16

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	1717	0	1660	8	0
1	B	1735	0	1686	14	0
2	A	2	0	0	0	0
2	B	2	0	0	0	0
3	A	309	0	0	1	2
3	B	298	0	0	0	1
All	All	4063	0	3346	22	2

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 3.

All (22) 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:268:LYS:NZ	3:A:401:HOH:O	2.11	0.82
1:A:230:ALA:O	1:A:234:ARG:HG3	2.09	0.52
1:A:119:THR:O	1:A:120:HIS:HB3	2.11	0.50
1:B:119:THR:O	1:B:120:HIS:HB3	2.11	0.49
1:B:188:GLY:C	1:B:229:TYR:CD2	2.91	0.48
1:B:67[A]:MET:HG3	1:B:73:VAL:CG2	2.44	0.48
1:B:126:MET:O	1:B:129[B]:MET:HG2	2.13	0.48
1:A:189:HIS:CD2	1:A:208:CYS:HB2	2.50	0.47
1:B:181:LYS:HA	1:B:181:LYS:HD3	1.80	0.47
1:A:210:ILE:C	1:A:211:LYS:HD3	2.39	0.47
1:B:129[A]:MET:HE1	1:B:139:THR:HG21	1.97	0.46
1:A:126:MET:O	1:A:129:MET:HG2	2.15	0.45
1:B:181:LYS:HE3	1:B:199[B]:ASP:OD2	2.16	0.45
1:B:64:TYR:CE2	1:B:74:ALA:HB2	2.53	0.44
1:B:189:HIS:HA	1:B:229:TYR:HE2	1.82	0.44
1:B:261:HIS:CD2	1:B:265:MET:HE2	2.53	0.44
1:B:210:ILE:C	1:B:211:LYS:HD3	2.42	0.44
1:A:93:TRP:CZ3	1:A:124:ASP:HB3	2.53	0.43
1:B:129[B]:MET:HG3	1:B:155:VAL:O	2.18	0.43
1:B:189:HIS:CD2	1:B:190:THR:HG23	2.55	0.41
1:B:248[B]:MET:SD	1:B:251:SER:HB2	2.61	0.41
1:A:120:HIS:HB3	1:A:193:ASN:HA	2.02	0.40

All (2) 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)
3:A:441:HOH:O	3:A:551:HOH:O[2_647]	2.09	0.11
3:A:547:HOH:O	3:B:406:HOH:O[2_658]	2.17	0.03

### 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	231/230 (100%)	227 (98%)	4 (2%)	0	100	100
1	B	234/230 (102%)	230 (98%)	4 (2%)	0	100	100
All	All	465/460 (101%)	457 (98%)	8 (2%)	0	100	100

There are no Ramachandran outliers to report.

#### 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	173/172 (101%)	172 (99%)	1 (1%)	78	56
1	B	176/172 (102%)	175 (99%)	1 (1%)	78	56
All	All	349/344 (102%)	347 (99%)	2 (1%)	78	56

All (2) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	193	ASN
1	B	193	ASN



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

Mol	Chain	Res	Type
1	A	120	HIS
1	B	97	GLN
1	B	107	GLN

### 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 oligosaccharides in this entry.

## 5.6 Ligand geometry ⓘ

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 ⓘ

There are no such residues in this entry.

## 5.8 Polymer linkage issues ⓘ

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	229/230 (99%)	0.40	18 (7%) 18 19	10, 18, 40, 55	4 (1%)
1	B	229/230 (99%)	0.11	6 (2%) 57 60	7, 15, 29, 44	7 (3%)
All	All	458/460 (99%)	0.26	24 (5%) 33 35	7, 16, 35, 55	11 (2%)

All (24) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	68[A]	PRO	5.1
1	A	264[A]	ARG	4.4
1	B	70	PHE	4.3
1	A	260	THR	3.5
1	A	269	LEU	3.5
1	A	68	PRO	3.4
1	A	42	GLY	3.1
1	A	69	GLY	3.0
1	A	70	PHE	3.0
1	A	266	ALA	2.8
1	A	270	ARG	2.8
1	A	220	ASN	2.8
1	B	69[A]	GLY	2.7
1	A	268	LYS	2.7
1	A	67	MET	2.6
1	A	226	THR	2.6
1	A	242	LYS	2.6
1	B	219	GLY	2.5
1	B	220	ASN	2.4
1	A	221	LEU	2.3
1	A	219	GLY	2.3
1	B	229	TYR	2.2
1	A	267	ASP	2.1
1	A	229	TYR	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 oligosaccharides in this entry.

## 6.4 Ligands [i](#)

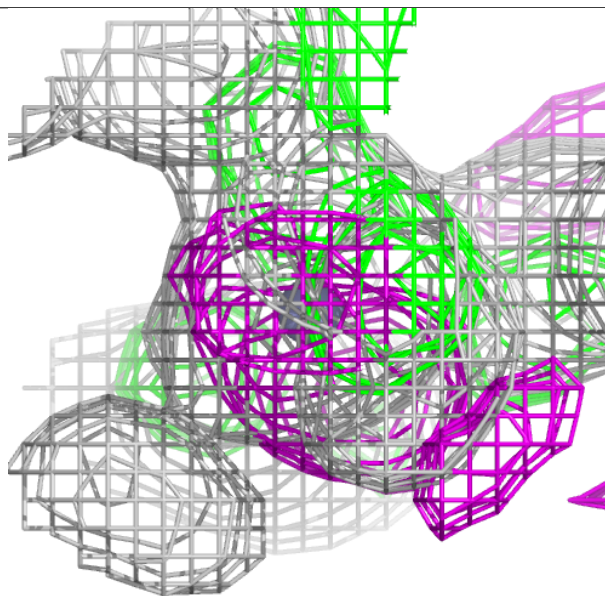
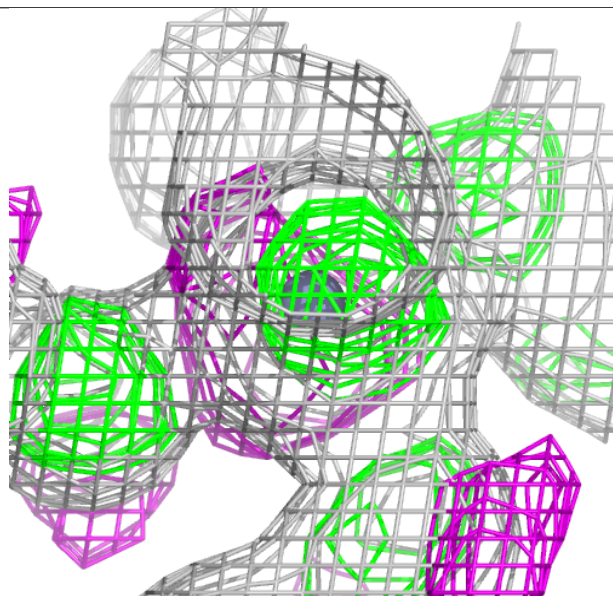
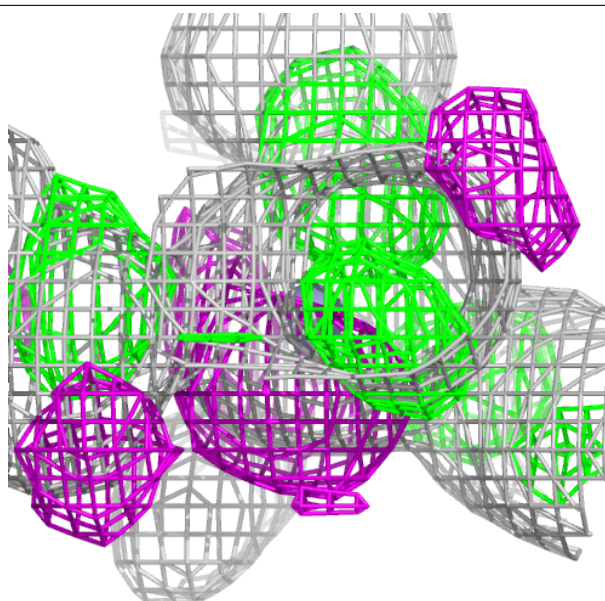
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95<sup>th</sup> percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 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
2	ZN	B	302	1/1	0.93	0.08	20,20,20,20	0
2	ZN	A	302	1/1	0.98	0.04	20,20,20,20	0
2	ZN	B	301	1/1	0.98	0.04	15,15,15,15	0
2	ZN	A	301	1/1	0.98	0.04	16,16,16,16	0

The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.

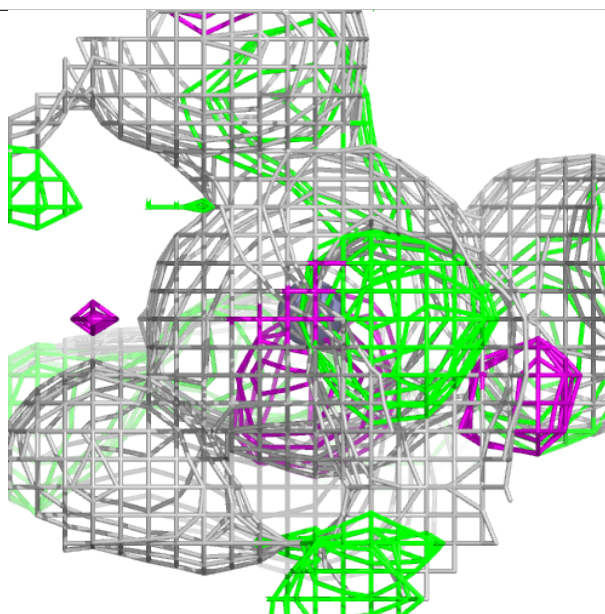
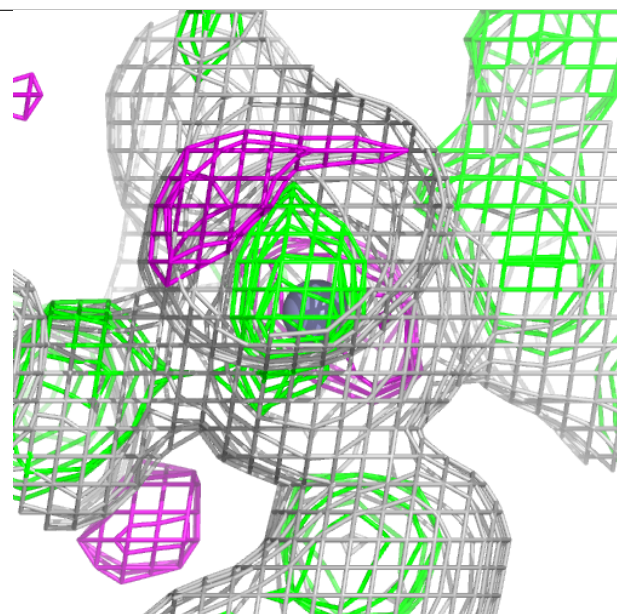
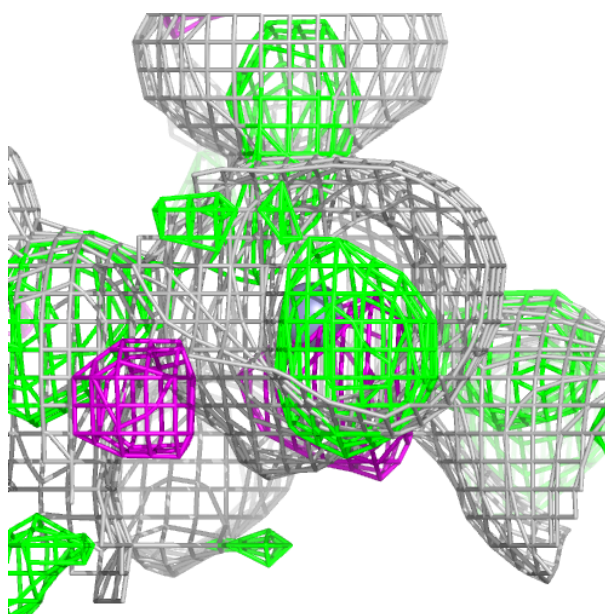
**Electron density around ZN B 302:**

$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)



**Electron density around ZN A 302:**

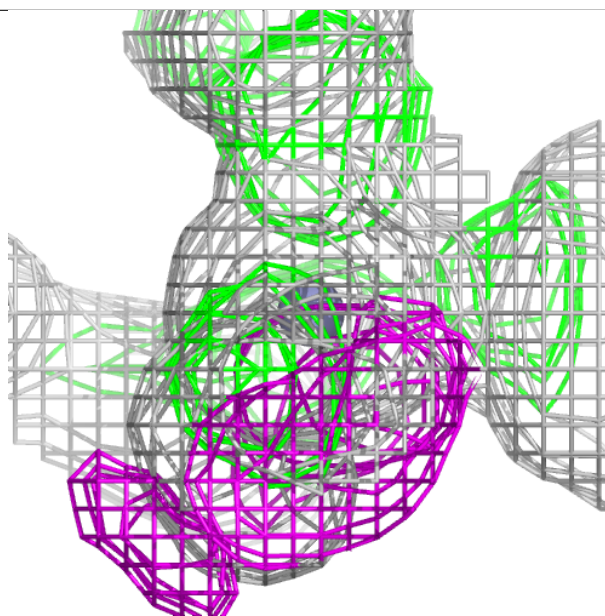
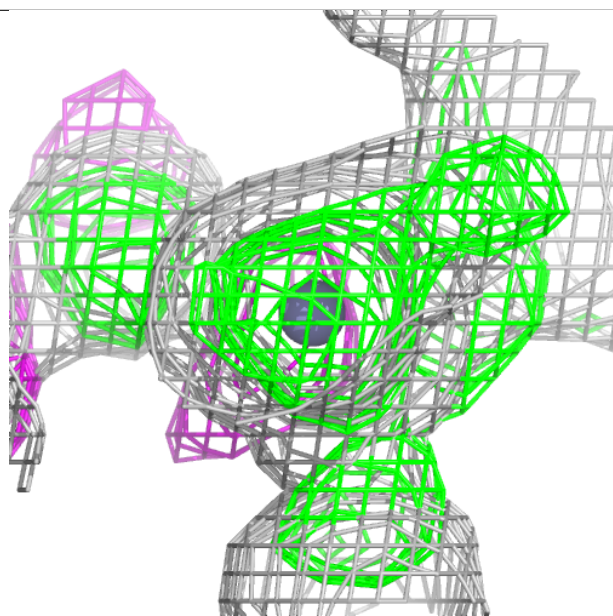
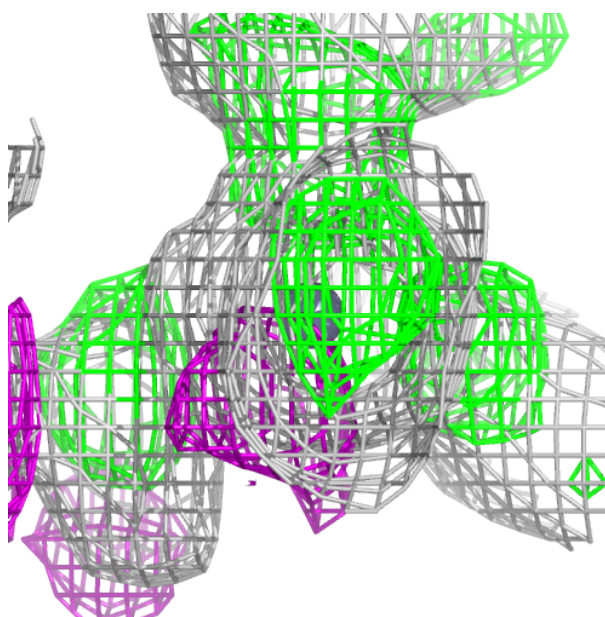
$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)





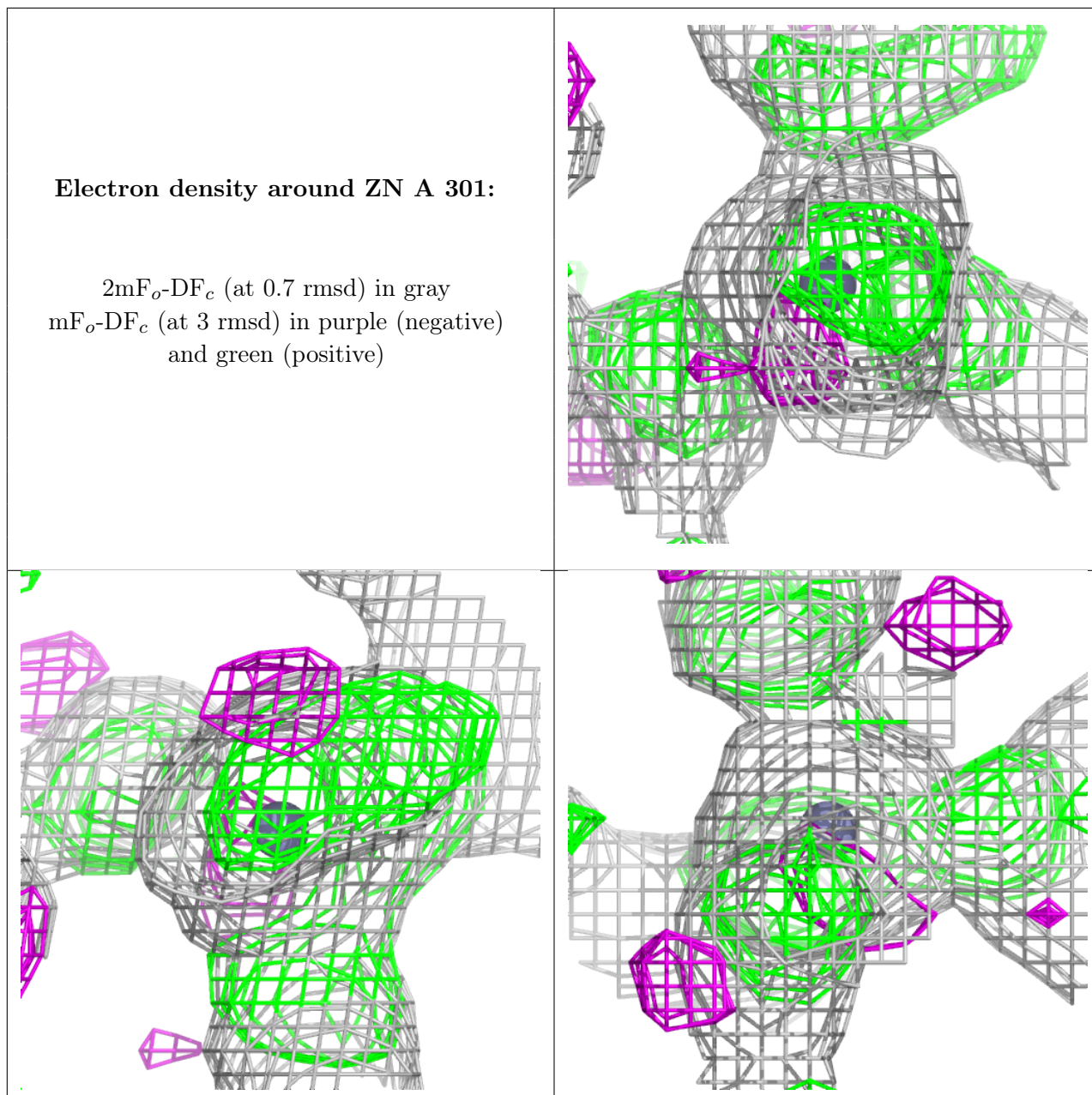
**Electron density around ZN B 301:**

$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)



**Electron density around ZN A 301:**

$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)



## 6.5 Other polymers ⓘ

There are no such residues in this entry.