

wwPDB X-ray Structure Validation Summary Report (i)

May 31, 2021 – 12:07 PM JST

PDB ID : 7DH7

Title : Crystal structure of apo XcZur

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Deposited on : 2020-11-13

Resolution : 2.20 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
A user guide is available at

https://www.wwpdb.org/validation/2017/XrayValidationReportHelp with specific help available everywhere you see the (i) symbol.

The following versions of software and data (see references (1)) 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 : 2.19

buster-report : 1.1.7 (2018)

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)

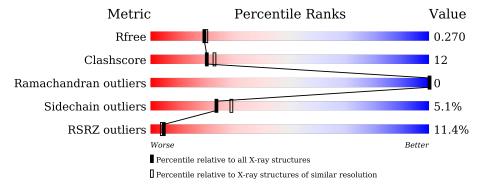
Validation Pipeline (wwPDB-VP) : 2.19

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure: X-RAY DIFFRACTION

The reported resolution of this entry is 2.20 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 $(\# \mathrm{Entries})$	$\begin{array}{c} {\rm Similar\ resolution} \\ (\#{\rm Entries},{\rm resolution\ range}(\mathring{\rm A})) \end{array}$
R_{free}	130704	4898 (2.20-2.20)
Clashscore	141614	5594 (2.20-2.20)
Ramachandran outliers	138981	5503 (2.20-2.20)
Sidechain outliers	138945	5504 (2.20-2.20)
RSRZ outliers	127900	4800 (2.20-2.20)

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 of the lower bar indicate the fraction of residues that contain outliers for >=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 <=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	170	72%	14%	13%
1	В	170	70%	15%	13%
1	С	170	72%	16%	12%
1	D	170	9%	19%	 12%



2 Entry composition (i)

There are 4 unique types of molecules in this entry. The entry contains 4914 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 Transcriptional regulator fur family.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf	Trace			
1	Λ	148	Total	С	N	О	S	0	0	0
1	A	140	1129	706	210	206	7	0	U	U
1	В	148	Total	С	N	О	S	0	0	0
1	Ъ	140	1131	708	210	206	7	0		U
1	С	150	Total	С	N	О	S	0	0	0
1		150	1146	717	214	208	7	0	U	U
1	D	150	Total	С	N	О	S	0	0	0
1	ע	150	1140	713	212	208	7		U	U

There are 56 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	2	MET	-	initiating methionine	UNP Q4UWS5
A	3	GLY	-	expression tag	UNP Q4UWS5
A	4	SER	-	expression tag	UNP Q4UWS5
A	5	SER	-	expression tag	UNP Q4UWS5
A	6	HIS	-	expression tag	UNP Q4UWS5
A	7	HIS	-	expression tag	UNP Q4UWS5
A	8	HIS	-	expression tag	UNP Q4UWS5
A	9	HIS	-	expression tag	UNP Q4UWS5
A	10	HIS	-	expression tag	UNP Q4UWS5
A	11	HIS	-	expression tag	UNP Q4UWS5
A	12	SER	-	expression tag	UNP Q4UWS5
A	13	GLN	-	expression tag	UNP Q4UWS5
A	14	GLY	_	expression tag	UNP Q4UWS5
A	15	SER	-	expression tag	UNP Q4UWS5
В	2	MET	_	initiating methionine	UNP Q4UWS5
В	3	GLY	-	expression tag	UNP Q4UWS5
В	4	SER	-	expression tag	UNP Q4UWS5
В	5	SER	-	expression tag	UNP Q4UWS5
В	6	HIS		expression tag	UNP Q4UWS5
В	7	HIS	-	expression tag	UNP Q4UWS5
В	8	HIS	_	expression tag	UNP Q4UWS5



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Chain	Residue	Modelled	Actual	Comment	Reference
В	9	HIS	-	expression tag	UNP Q4UWS5
В	10	HIS	_	expression tag	UNP Q4UWS5
В	11	HIS	-	expression tag	UNP Q4UWS5
В	12	SER	-	expression tag	UNP Q4UWS5
В	13	GLN	-	expression tag	UNP Q4UWS5
В	14	GLY	-	expression tag	UNP Q4UWS5
В	15	SER	-	expression tag	UNP Q4UWS5
С	2	MET	-	initiating methionine	UNP Q4UWS5
С	3	GLY	-	expression tag	UNP Q4UWS5
С	4	SER	-	expression tag	UNP Q4UWS5
С	5	SER	-	expression tag	UNP Q4UWS5
С	6	HIS	-	expression tag	UNP Q4UWS5
С	7	HIS	-	expression tag	UNP Q4UWS5
С	8	HIS	-	expression tag	UNP Q4UWS5
С	9	HIS	-	expression tag	UNP Q4UWS5
С	10	HIS	-	expression tag	UNP Q4UWS5
С	11	HIS	-	expression tag	UNP Q4UWS5
С	12	SER	-	expression tag	UNP Q4UWS5
С	13	GLN	-	expression tag	UNP Q4UWS5
С	14	GLY	-	expression tag	UNP Q4UWS5
С	15	SER	-	expression tag	UNP Q4UWS5
D	2	MET	-	initiating methionine	UNP Q4UWS5
D	3	GLY	-	expression tag	UNP Q4UWS5
D	4	SER	-	expression tag	UNP Q4UWS5
D	5	SER	-	expression tag	UNP Q4UWS5
D	6	HIS	-	expression tag	UNP Q4UWS5
D	7	HIS	-	expression tag	UNP Q4UWS5
D	8	HIS	-	expression tag	UNP Q4UWS5
D	9	HIS	-	expression tag	UNP Q4UWS5
D	10	HIS	-	expression tag	UNP Q4UWS5
D	11	HIS	-	expression tag	UNP Q4UWS5
D	12	SER	-	expression tag	UNP Q4UWS5
D	13	GLN	-	expression tag	UNP Q4UWS5
D	14	GLY	-	expression tag	UNP Q4UWS5
D	15	SER	-	expression tag	UNP Q4UWS5

• Molecule 2 is ZINC ION (three-letter code: ZN) (formula: Zn) (labeled as "Ligand of Interest" by depositor).

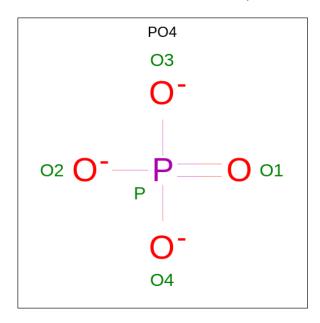
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	1	Total Zn 1 1	0	0



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Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	В	1	Total Zn 1 1	0	0
2	С	1	Total Zn 1 1	0	0
2	D	1	Total Zn 1 1	0	0

• Molecule 3 is PHOSPHATE ION (three-letter code: PO4) (formula: O_4P).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	1	Total O P 5 4 1	0	0
3	В	1	Total O P 5 4 1	0	0
3	С	1	Total O P 5 4 1	0	0
3	D	1	Total O P 5 4 1	0	0
3	D	1	Total O P 5 4 1	0	0

• Molecule 4 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	99	Total O 99 99	0	0



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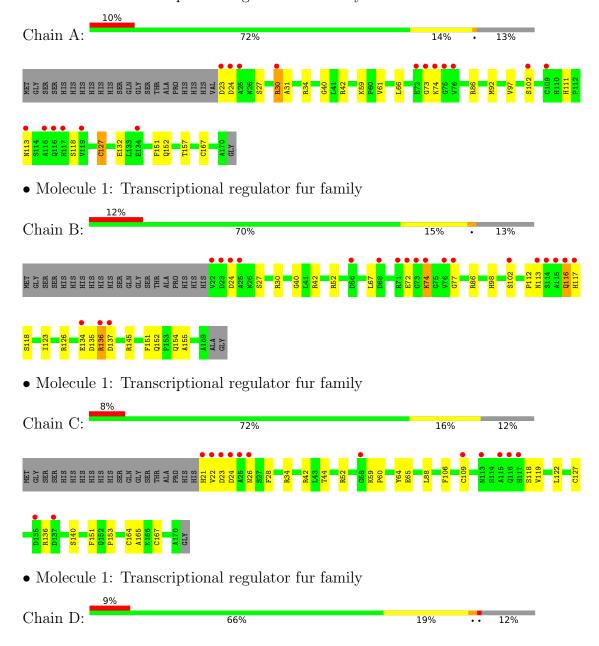
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	В	88	Total O 88 88	0	0
4	С	81	Total O 81 81	0	0
4	D	71	Total O 71 71	0	0



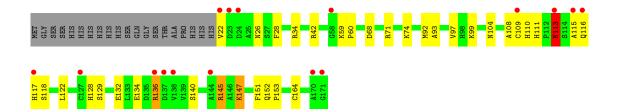
3 Residue-property plots (i)

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: Transcriptional regulator fur family









4 Data and refinement statistics (i)

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants	153.39Å 77.87Å 73.06Å	Donositon
a, b, c, α , β , γ	90.00° 103.07° 90.00°	Depositor
Resolution (Å)	38.94 - 2.20	Depositor
Resolution (A)	38.94 - 2.20	EDS
% Data completeness	99.5 (38.94-2.20)	Depositor
(in resolution range)	99.5 (38.94-2.20)	EDS
R_{merge}	0.05	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) > 1$	2.58 (at 2.20Å)	Xtriage
Refinement program	PHENIX 1.18rc1_3777	Depositor
D D.	0.219 , 0.276	Depositor
R, R_{free}	0.218 , 0.270	DCC
R_{free} test set	2029 reflections (4.79%)	wwPDB-VP
Wilson B-factor (Å ²)	22.0	Xtriage
Anisotropy	0.000	Xtriage
Bulk solvent $k_{sol}(e/Å^3)$, $B_{sol}(Å^2)$	0.37, 62.5	EDS
L-test for twinning ²	$ < L > = 0.49, < L^2> = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.92	EDS
Total number of atoms	4914	wwPDB-VP
Average B, all atoms (Å ²)	40.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: The largest off-origin peak in the Patterson function is 16.14% of the height of the origin peak. No significant pseudotranslation is detected.

²Theoretical values of <|L|>, $<L^2>$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.



¹Intensities estimated from amplitudes.

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: PO4, 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	
IVIOI	Chain	RMSZ	# Z > 5	RMSZ	# Z > 5
1	A	0.45	0/1151	0.63	0/1561
1	В	0.49	0/1153	0.63	0/1564
1	С	0.50	0/1169	0.68	0/1586
1	D	0.48	0/1162	0.66	1/1576 (0.1%)
All	All	0.48	0/4635	0.65	1/6287 (0.0%)

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 maintain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	В	0	1

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	\mathbf{Z}	$Observed(^{o})$	$\operatorname{Ideal}(^{o})$
1	D	113	ASN	CB-CA-C	5.09	120.59	110.40

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	В	113	ASN	Peptide



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	1129	0	1116	33	0
1	В	1131	0	1120	35	0
1	С	1146	0	1132	24	0
1	D	1140	0	1129	43	0
2	A	1	0	0	0	0
2	В	1	0	0	0	0
2	С	1	0	0	0	0
2	D	1	0	0	0	0
3	A	5	0	0	0	0
3	В	5	0	0	0	0
3	С	5	0	0	0	0
3	D	10	0	0	0	0
4	A	99	0	0	7	0
4	В	88	0	0	9	0
4	С	81	0	0	1	0
4	D	71	0	0	3	0
All	All	4914	0	4497	113	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 12.

The worst 5 of 113 close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	$\begin{array}{c} {\rm Interatomic} \\ {\rm distance} \ (\rm \mathring{A}) \end{array}$	$egin{aligned} ext{Clash} \ ext{overlap } (ext{Å}) \end{aligned}$
1:A:74:LYS:HA	1:A:74:LYS:HE2	1.36	1.06
1:B:136:ARG:NH1	4:B:302:HOH:O	2.02	0.93
1:D:116:GLN:OE1	4:D:301:HOH:O	1.91	0.88
1:D:147:LYS:HE3	1:D:152:GLN:HE22	1.39	0.88
1:B:151:PHE:CD1	1:D:122:LEU:HD21	2.09	0.86

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 Allow		Outliers	Percentiles	
1	A	146/170~(86%)	139 (95%)	7 (5%)	0	100	100
1	В	146/170~(86%)	140 (96%)	6 (4%)	0	100	100
1	С	148/170~(87%)	144 (97%)	4 (3%)	0	100	100
1	D	148/170 (87%)	143 (97%)	5 (3%)	0	100	100
All	All	588/680~(86%)	566 (96%)	22 (4%)	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	Perce	ntiles
1	A	117/135 (87%)	114 (97%)	3 (3%)	46	58
1	В	118/135 (87%)	110 (93%)	8 (7%)	16	17
1	С	119/135 (88%)	114 (96%)	5 (4%)	30	38
1	D	118/135 (87%)	110 (93%)	8 (7%)	16	17
All	All	472/540 (87%)	448 (95%)	24 (5%)	24	29

5 of 24 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	С	140	SER
1	D	118	SER
1	D	113	ASN



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Mol	Chain	Res	Type
1	D	129	SER
1	В	74	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (4) such sidechains are listed below:

Mol	Chain	Res	Type
1	D	113	ASN
1	D	116	GLN
1	D	117	HIS
1	D	152	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 monosaccharides in this entry.

5.6 Ligand geometry (i)

Of 9 ligands modelled in this entry, 4 are monoatomic - leaving 5 for Mogul analysis.

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	Mol Type Chain Res		Chain Res Link		B	Bond lengths			Bond angles		
MIOI	туре	Chain	nes	Lilik	Counts	RMSZ	# Z >2	Counts	RMSZ	# Z > 2	
3	PO4	D	203	-	4,4,4	0.87	0	6,6,6	0.40	0	
3	PO4	D	202	-	4,4,4	1.05	0	6,6,6	0.83	0	
3	PO4	С	202	-	4,4,4	0.95	0	6,6,6	0.38	0	



Mol	Т	Chain	Dag	Timle	В	ond leng	$_{ m gths}$	В	ond ang	gles
MIOI	Type	Chain	Res	Link	Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
3	PO4	В	202	-	4,4,4	1.08	0	6,6,6	0.59	0
3	PO4	A	202	-	4,4,4	1.36	0	6,6,6	1.25	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.

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 (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^{th} 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>	# RSRZ > 2		$OWAB(A^2)$	Q < 0.9	
1	A	148/170 (87%)	0.66	17 (11%)	4	4	11, 29, 78, 152	0
1	В	148/170 (87%)	0.92	21 (14%)	2	2	12, 36, 78, 130	0
1	С	150/170 (88%)	0.60	14 (9%)	8	7	10, 36, 88, 132	0
1	D	150/170 (88%)	0.74	16 (10%)	6	5	10, 38, 73, 127	0
All	All	596/680 (87%)	0.73	68 (11%)	5	4	10, 36, 82, 152	0

The worst 5 of 68 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	С	22	VAL	13.8
1	В	76	VAL	11.1
1	В	117	HIS	8.5
1	A	73	GLY	8.1
1	D	117	HIS	7.9

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 monosaccharides 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^{th} 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.



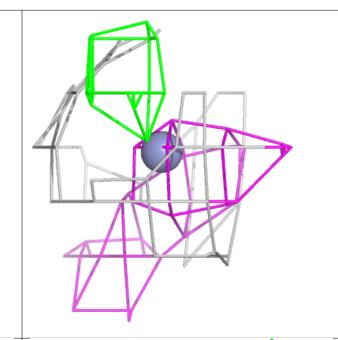
Mol	Type	Chain	Res	Atoms	RSCC	RSR	$\mathbf{B} ext{-}\mathbf{factors}(\mathbf{\mathring{A}}^2)$	Q < 0.9
3	PO4	С	202	5/5	0.92	0.26	74,78,84,84	0
3	PO4	D	203	5/5	0.94	0.17	62,67,71,75	0
3	PO4	D	202	5/5	0.95	0.19	38,42,46,51	0
3	PO4	В	202	5/5	0.97	0.17	39,40,43,54	0
2	ZN	С	201	1/1	0.98	0.11	28,28,28,28	0
2	ZN	D	201	1/1	0.98	0.14	34,34,34,34	0
2	ZN	В	201	1/1	0.98	0.07	39,39,39,39	0
2	ZN	A	201	1/1	0.99	0.07	29,29,29,29	0
3	PO4	A	202	5/5	0.99	0.17	15,25,26,27	0

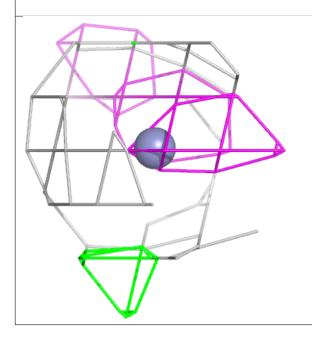
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

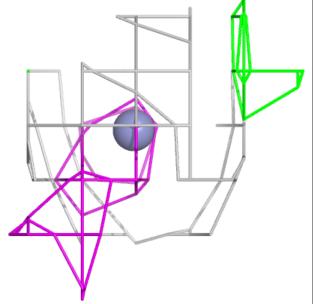


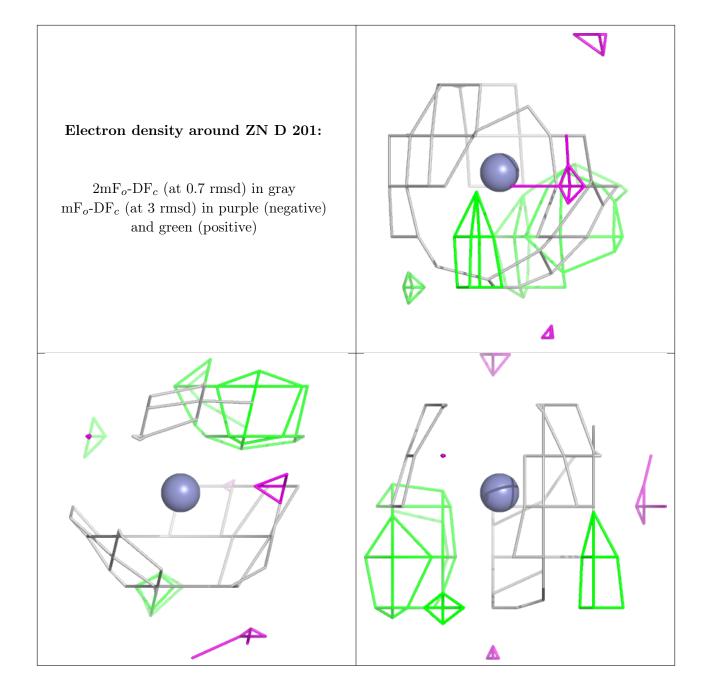
Electron density around ZN C 201:

 $2 \mathrm{mF}_o\text{-}\mathrm{DF}_c$ (at 0.7 rmsd) in gray $\mathrm{mF}_o\text{-}\mathrm{DF}_c$ (at 3 rmsd) in purple (negative) and green (positive)

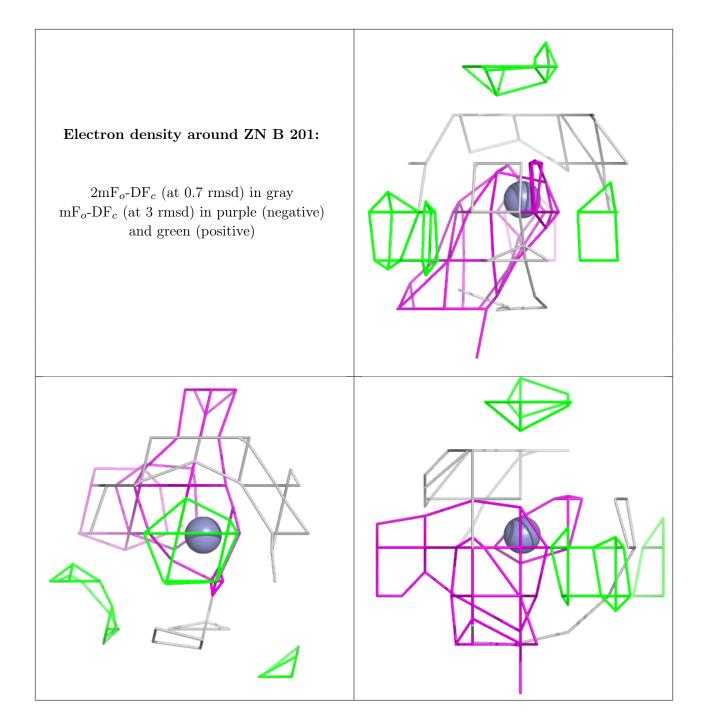




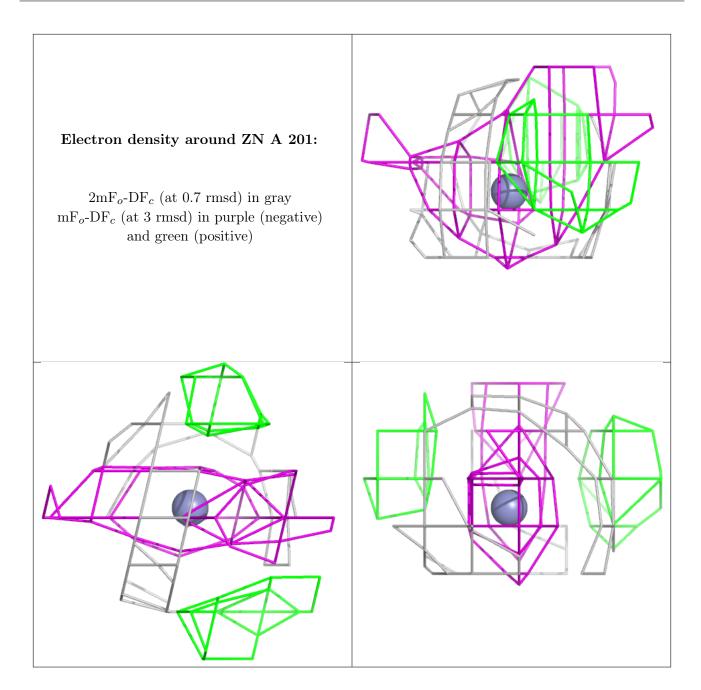












6.5 Other polymers (i)

There are no such residues in this entry.

