Full wwPDB X-ray Structure Validation Report (i)

Dec 1, 2025 – 04:33 PM JST

PDB ID	:	9LNK / pdb_00009lnk
Title	:	Crystal structure of VANC21 in complex with its target DNA (native).
Authors	:	Tanaka, Y.; Shihoya, W.; Hirano, H.; Itoh, Y.; Kakutani, T.; Nureki, O.
Deposited on	:	2025-01-21
Resolution	:	2.55 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*
A user guide is available at
https://www.wwpdb.org/validation/2017/XrayValidationReportHelp
with specific help available everywhere you see the (i) symbol.

The types of validation reports are described at
http://www.wwpdb.org/validation/2017/FAQs#types.

The following versions of software and data (see references (1)) were used in the production of this report:

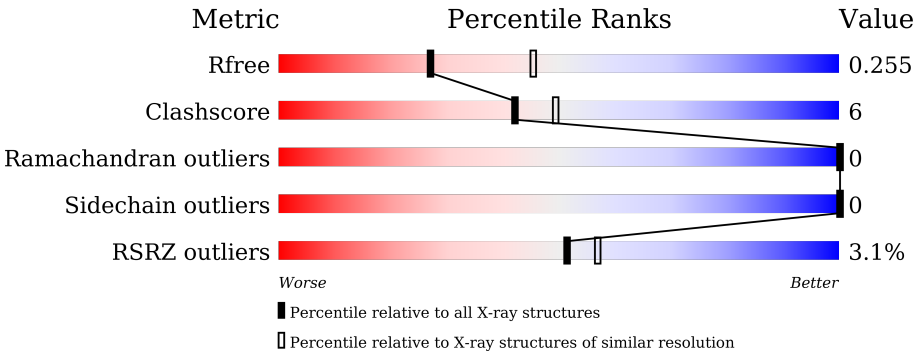
MolProbity	:	4-5-2 with Phenix2.0
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.46

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 2.55 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}	164625	1004 (2.54-2.54)
Clashscore	180529	1055 (2.54-2.54)
Ramachandran outliers	177936	1048 (2.54-2.54)
Sidechain outliers	177891	1048 (2.54-2.54)
RSRZ outliers	164620	1004 (2.54-2.54)

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	383	3% 80% 14% 5%
2	B	15	67% 33%
3	C	15	53% 47%

2 Entry composition (i)

There are 5 unique types of molecules in this entry. The entry contains 3619 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 VANC21.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	362	2937	1885	502	527	23	0	0	0

There are 24 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	256	MET	-	initiating methionine	UNP O80464
A	257	GLY	-	expression tag	UNP O80464
A	258	HIS	-	expression tag	UNP O80464
A	259	HIS	-	expression tag	UNP O80464
A	260	HIS	-	expression tag	UNP O80464
A	261	HIS	-	expression tag	UNP O80464
A	262	HIS	-	expression tag	UNP O80464
A	263	HIS	-	expression tag	UNP O80464
A	264	HIS	-	expression tag	UNP O80464
A	265	HIS	-	expression tag	UNP O80464
A	266	HIS	-	expression tag	UNP O80464
A	267	HIS	-	expression tag	UNP O80464
A	268	SER	-	expression tag	UNP O80464
A	269	SER	-	expression tag	UNP O80464
A	270	GLY	-	expression tag	UNP O80464
A	271	GLU	-	expression tag	UNP O80464
A	272	ASN	-	expression tag	UNP O80464
A	273	LEU	-	expression tag	UNP O80464
A	274	TYR	-	expression tag	UNP O80464
A	275	PHE	-	expression tag	UNP O80464
A	276	GLN	-	expression tag	UNP O80464
A	277	GLY	-	expression tag	UNP O80464
A	278	SER	-	expression tag	UNP O80464
A	279	HIS	-	expression tag	UNP O80464

- Molecule 2 is a DNA chain called VANC21 binding DNA fragment (motif strand).

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	15	Total	C	N	O	P	0	0	0
			300	147	48	91	14			

- Molecule 3 is a DNA chain called VANC21 binding DNA fragment (complementary strand).

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	C	15	Total	C	N	O	P	0	1	0
			327	159	66	88	14			

- Molecule 4 is ZINC ION (CCD ID: ZN) (formula: Zn) (labeled as "Ligand of Interest" by depositor).

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

- Molecule 5 is water.

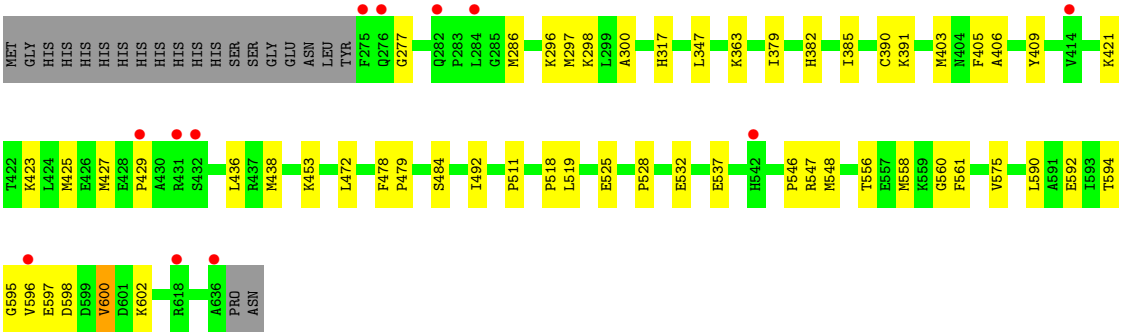
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	46	Total	O	0	0
			46	46		
5	B	4	Total	O	0	0
			4	4		
5	C	4	Total	O	0	0
			4	4		

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.

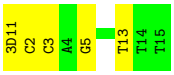
- Molecule 1: VANC21

Chain A:



- Molecule 2: VANC21 binding DNA fragment (motif strand)

Chain B:



- Molecule 3: VANC21 binding DNA fragment (complementary strand)

Chain C:

4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α, β, γ	52.64Å 96.85Å 167.39Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	48.35 – 2.55 48.35 – 2.55	Depositor EDS
% Data completeness (in resolution range)	99.8 (48.35-2.55) 99.8 (48.35-2.55)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.35 (at 2.54Å)	Xtriage
Refinement program	PHENIX (1.20.1_4487: ???)	Depositor
R, R_{free}	0.221 , 0.255 0.221 , 0.255	Depositor DCC
R_{free} test set	1434 reflections (4.99%)	wwPDB-VP
Wilson B-factor (Å^2)	69.7	Xtriage
Anisotropy	0.118	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.31 , 39.7	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	0.94	EDS
Total number of atoms	3619	wwPDB-VP
Average B, all atoms (Å^2)	74.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.50% of the height of the origin peak. No significant pseudotranslation is detected.*

[1] Intensities estimated from amplitudes.

[2] Theoretical 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.

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: ZN, 3D1

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	0.56	0/3015	0.67	4/4070 (0.1%)
2	B	0.47	0/313	0.70	0/480
3	C	0.44	0/327	0.66	0/503
All	All	0.54	0/3655	0.67	4/5053 (0.1%)

There are no bond length outliers.

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	596	VAL	N-CA-C	-11.34	101.61	112.83
1	A	277	GLY	N-CA-C	10.36	121.79	111.95
1	A	347	LEU	N-CA-C	8.21	124.30	113.30
1	A	600	VAL	N-CA-C	5.18	115.77	108.36

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts

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	2937	0	2902	34	0
2	B	300	0	174	5	0
3	C	327	0	183	8	0
4	A	1	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
5	A	46	0	0	1	0
5	B	4	0	0	0	0
5	C	4	0	0	0	0
All	All	3619	0	3259	42	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 6.

All (42) 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)
3:C:1[A]:3D1:H2'1	3:C:2:DA:C8	2.33	0.63
1:A:363:LYS:HE3	1:A:602:LYS:HE3	1.80	0.63
1:A:590:LEU:O	1:A:594:THR:OG1	2.23	0.56
1:A:453:LYS:HE3	3:C:3:DG:N7	2.22	0.55
1:A:525:GLU:OE1	1:A:547:ARG:HD2	2.08	0.54
2:B:13:DT:O4	3:C:1[A]:3D1:N6	2.41	0.54
1:A:391:LYS:HE2	1:A:592:GLU:O	2.08	0.53
1:A:595:GLY:HA3	1:A:597:GLU:CD	2.33	0.53
1:A:436:LEU:HD23	1:A:472:LEU:HD13	1.89	0.53
1:A:558:MET:HB2	1:A:560:GLY:O	2.12	0.50
1:A:385:ILE:O	1:A:548:MET:HG2	2.11	0.50
1:A:600:VAL:HG13	1:A:600:VAL:O	2.11	0.50
1:A:317:HIS:HB3	1:A:429:PRO:HG3	1.95	0.49
2:B:2:DC:H2'	2:B:3:DC:C6	2.48	0.49
1:A:421:LYS:O	1:A:425:MET:HG3	2.13	0.47
1:A:385:ILE:HG21	1:A:518:PRO:HA	1.96	0.47
1:A:423:LYS:O	1:A:427:MET:HG3	2.13	0.47
2:B:1:3D1:C2	3:C:13:DT:H3	2.26	0.46
1:A:286:MET:HE3	1:A:286:MET:HB3	1.84	0.46
1:A:409:TYR:O	1:A:423:LYS:NZ	2.49	0.46
3:C:12:DG:H2"	3:C:13:DT:H5'	1.97	0.46
1:A:405:PHE:CZ	1:A:438:MET:HE2	2.52	0.45
2:B:13:DT:H3	3:C:1[B]:3D1:C2	2.31	0.44
1:A:597:GLU:O	1:A:598:ASP:C	2.60	0.43
1:A:385:ILE:O	1:A:546:PRO:HB2	2.18	0.43
1:A:492:ILE:HD11	1:A:519:LEU:HD11	1.99	0.43
1:A:296:LYS:HB2	5:A:843:HOH:O	2.18	0.43
1:A:438:MET:HE2	1:A:438:MET:HB2	1.89	0.43
1:A:478:PHE:HA	1:A:479:PRO:HD3	1.89	0.42
1:A:556:THR:HG21	1:A:561:PHE:HD1	1.83	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:528:PRO:HD2	1:A:575:VAL:O	2.19	0.42
1:A:478:PHE:CD1	1:A:479:PRO:HD2	2.55	0.42
1:A:528:PRO:O	1:A:532:GLU:HG3	2.20	0.41
3:C:12:DG:H2'	3:C:13:DT:C6	2.55	0.41
1:A:382:HIS:NE2	1:A:484:SER:OG	2.44	0.41
1:A:403:MET:CE	1:A:406:ALA:HB3	2.51	0.41
3:C:9:DC:H2"	3:C:10:DT:H5'	2.03	0.41
1:A:300:ALA:HB3	1:A:511:PRO:HA	2.03	0.41
1:A:379:ILE:HG12	1:A:390:CYS:HB3	2.02	0.41
1:A:298:LYS:HE2	2:B:5:DG:N7	2.37	0.40
1:A:297:MET:HE3	1:A:297:MET:HB3	1.92	0.40
1:A:537:GLU:H	1:A:537:GLU:HG2	1.73	0.40

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	360/383 (94%)	352 (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	319/338 (94%)	319 (100%)	0	100 100

There are no protein residues with a non-rotameric sidechain to report.

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

Mol	Chain	Res	Type
1	A	603	HIS

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)

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^{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>2	OWAB(Å^2)	Q<0.9
1	A	362/383 (94%)	0.27	12 (3%) 49 55	51, 69, 110, 153	0
2	B	14/15 (93%)	-0.48	0 100 100	56, 68, 92, 111	0
3	C	14/15 (93%)	-0.32	0 100 100	58, 71, 103, 110	0
All	All	390/413 (94%)	0.22	12 (3%) 51 57	51, 69, 110, 153	0

All (12) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	275	PHE	5.5
1	A	596	VAL	4.8
1	A	636	ALA	3.9
1	A	431	ARG	3.3
1	A	432	SER	3.2
1	A	282	GLN	2.9
1	A	276	GLN	2.7
1	A	429	PRO	2.3
1	A	414	VAL	2.3
1	A	284	LEU	2.2
1	A	618	ARG	2.2
1	A	542	HIS	2.1

6.2 Non-standard residues in protein, DNA, RNA chains

There are no non-standard protein/DNA/RNA residues in this entry.

6.3 Carbohydrates

There are no oligosaccharides in this entry.

6.4 Ligands (i)

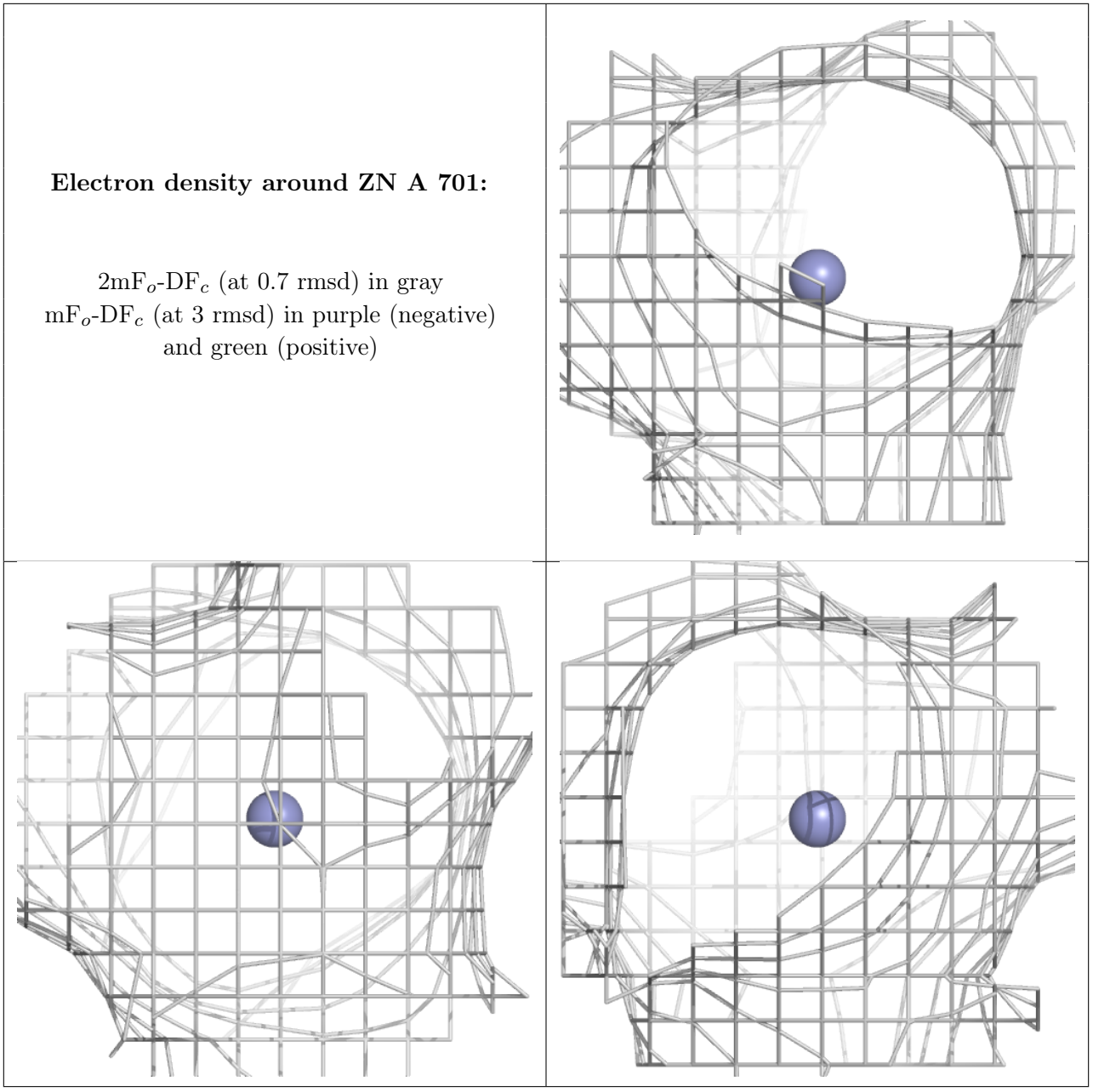
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95^{th} percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
4	ZN	A	701	1/1	0.99	0.03	67,67,67,67	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 A 701:

$2mF_o$-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 (i)

There are no such residues in this entry.