



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 12, 2026 – 04:20 PM UTC

PDB ID : 7S1O / pdb_00007s1o
Title : Structure of human POT1C
Authors : Aramburu, T.; Skordalakes, E.
Deposited on : 2021-09-02
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 ⓘ 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 ⓘ](#)) 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

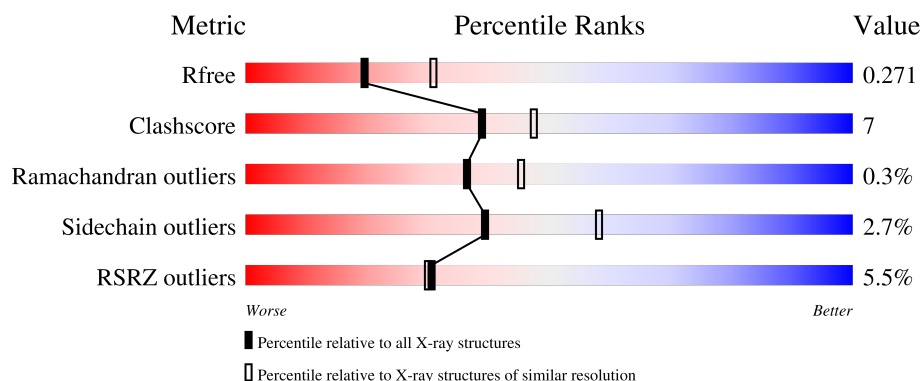
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 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}	180053	1091 (2.54-2.54)
Clashscore	190562	1120 (2.54-2.54)
Ramachandran outliers	187476	1106 (2.54-2.54)
Sidechain outliers	187428	1106 (2.54-2.54)
RSRZ outliers	180081	1091 (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 $\leq 5\%$. 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	313	7% 76% 19% • •
1	B	313	3% 79% 18% •

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 4844 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 Protection of telomeres protein 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	302	Total	C	N	O	S	0	0	0
			2393	1528	398	451	16			
1	B	302	Total	C	N	O	S	0	0	0
			2393	1528	398	451	16			

There are 6 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	322	SER	-	expression tag	UNP Q9NUX5
A	323	ASN	-	expression tag	UNP Q9NUX5
A	324	ILE	-	expression tag	UNP Q9NUX5
B	322	SER	-	expression tag	UNP Q9NUX5
B	323	ASN	-	expression tag	UNP Q9NUX5
B	324	ILE	-	expression tag	UNP Q9NUX5

- 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	1	Total	Zn	0	0
			1	1		
2	B	1	Total	Zn	0	0
			1	1		

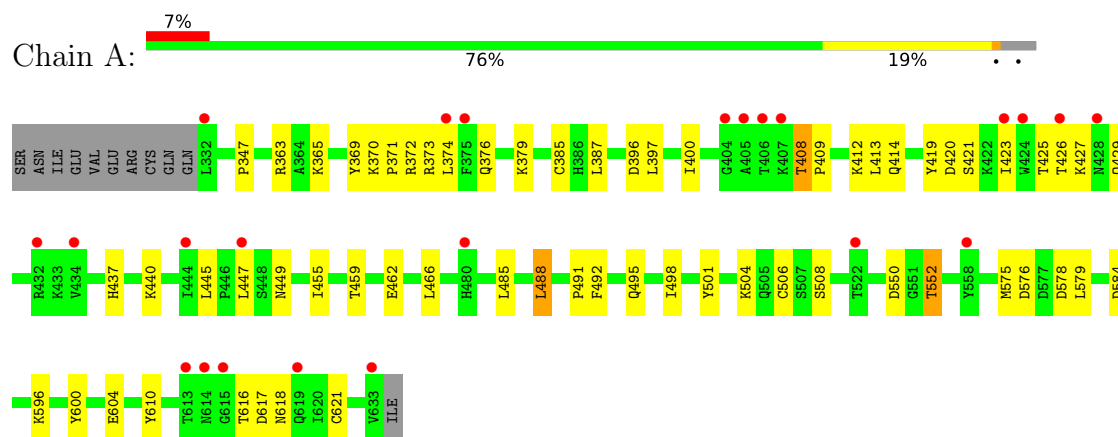
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	24	Total	O	0	0
			24	24		
3	B	32	Total	O	0	0
			32	32		

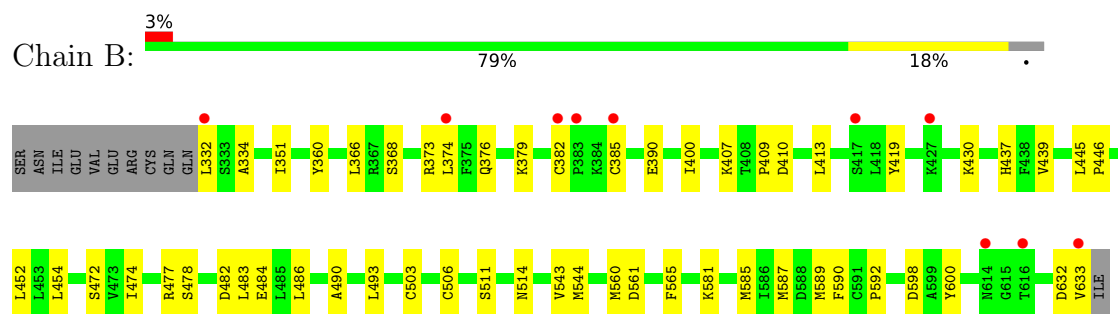
3 Residue-property plots

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: Protection of telomeres protein 1



• Molecule 1: Protection of telomeres protein 1



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	61.98Å 61.80Å 83.74Å 90.00° 94.50° 90.00°	Depositor
Resolution (Å)	28.98 – 2.55 28.98 – 2.55	Depositor EDS
% Data completeness (in resolution range)	98.7 (28.98-2.55) 98.6 (28.98-2.55)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.62 (at 2.54Å)	Xtriage
Refinement program	PHENIX 1.19.2_4158	Depositor
R, R_{free}	0.220 , 0.271 0.221 , 0.271	Depositor DCC
R_{free} test set	1028 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å ²)	48.3	Xtriage
Anisotropy	0.307	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.30 , 31.7	EDS
L-test for twinning ²	$\langle L \rangle = 0.51$, $\langle L^2 \rangle = 0.35$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.93	EDS
Total number of atoms	4844	wwPDB-VP
Average B, all atoms (Å ²)	53.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.01% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical 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

5.1 Standard geometry

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	0.25	0/2443	0.38	0/3314
1	B	0.12	0/2443	0.31	0/3314
All	All	0.19	0/4886	0.34	0/6628

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

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	2393	0	2404	35	0
1	B	2393	0	2405	31	0
2	A	1	0	0	0	0
2	B	1	0	0	0	0
3	A	24	0	0	0	0
3	B	32	0	0	1	0
All	All	4844	0	4809	65	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.

All (65) 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:370:LYS:HD3	1:A:371:PRO:HA	1.72	0.71
1:B:544:MET:HE1	1:B:587:MET:HE2	1.77	0.67
1:A:447:LEU:HG	1:A:449:ASN:H	1.60	0.65
1:B:472:SER:HB3	1:B:493:LEU:HD11	1.81	0.62
1:B:407:LYS:NZ	1:B:430:LYS:HE3	2.14	0.62
1:A:397:LEU:HD21	1:A:491:PRO:HD3	1.82	0.61
1:B:376:GLN:O	1:B:379:LYS:NZ	2.34	0.59
1:A:408:THR:HG22	1:A:409:PRO:HD2	1.85	0.57
1:A:488:LEU:HB3	1:A:504:LYS:HG2	1.86	0.57
1:B:419:TYR:HB3	1:B:439:VAL:HA	1.86	0.57
1:B:445:LEU:HD12	1:B:446:PRO:HD2	1.86	0.56
1:A:576:ASP:HB3	1:A:579:LEU:HB2	1.87	0.56
1:B:477:ARG:HG2	1:B:486:LEU:HA	1.87	0.56
1:A:365:LYS:NZ	1:A:600:TYR:O	2.38	0.55
1:B:385:CYS:HB2	1:B:506:CYS:SG	2.46	0.55
1:A:347:PRO:HB2	1:A:552:THR:HG21	1.88	0.54
1:A:420:ASP:OD2	1:A:445:LEU:HD11	2.07	0.54
1:A:396:ASP:O	1:A:400:ILE:HG12	2.08	0.53
1:B:334:ALA:HB1	1:B:589:MET:HE1	1.90	0.53
1:B:407:LYS:HZ1	1:B:430:LYS:HE3	1.72	0.53
1:B:482:ASP:OD2	1:B:511:SER:HB2	2.08	0.53
1:A:374:LEU:HD12	1:A:584:ASP:OD1	2.08	0.53
1:A:385:CYS:SG	1:A:387:LEU:HB2	2.50	0.52
1:B:482:ASP:OD1	1:B:483:LEU:N	2.42	0.52
1:A:373:ARG:HH11	1:A:373:ARG:HG2	1.74	0.51
1:B:437:HIS:HB2	1:B:454:LEU:HB2	1.94	0.50
1:B:366:LEU:HD23	1:B:590:PHE:HB3	1.94	0.49
1:A:385:CYS:HB3	1:A:506:CYS:SG	2.52	0.49
1:A:485:LEU:HD11	1:A:492:PHE:HB2	1.96	0.48
1:A:363:ARG:HG3	1:A:604:GLU:HB3	1.96	0.47
1:B:581:LYS:O	1:B:585:MET:HG3	2.14	0.47
1:B:592:PRO:HD2	1:B:600:TYR:CD1	2.50	0.47
1:A:412:LYS:HD3	1:A:413:LEU:HG	1.98	0.46
1:A:610:TYR:CE1	1:A:621:CYS:HB2	2.50	0.46
1:B:374:LEU:HD21	1:B:544:MET:HE3	1.98	0.46
1:A:488:LEU:HD12	1:A:488:LEU:HA	1.80	0.46
1:A:420:ASP:OD1	1:A:440:LYS:HE2	2.16	0.46
1:B:592:PRO:HD2	1:B:600:TYR:CE1	2.51	0.46
1:A:376:GLN:O	1:A:379:LYS:NZ	2.50	0.45
1:A:495:GLN:O	1:A:498:ILE:HD12	2.16	0.45
1:A:369:TYR:CE2	1:A:372:ARG:HA	2.52	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:414:GLN:HE21	1:A:421:SER:HB2	1.82	0.44
1:A:419:TYR:CD1	1:A:437:HIS:HB3	2.53	0.44
1:A:459:THR:N	1:A:462:GLU:OE1	2.38	0.44
1:B:477:ARG:NH2	1:B:484:GLU:OE1	2.51	0.43
1:A:488:LEU:HD23	1:A:504:LYS:HA	2.00	0.43
1:A:550:ASP:C	1:A:552:THR:H	2.27	0.43
1:B:382:CYS:SG	1:B:503:CYS:HB2	2.59	0.43
1:A:420:ASP:OD2	1:B:390:GLU:HB2	2.19	0.42
1:B:543:VAL:HG12	1:B:560:MET:HG3	2.01	0.42
1:B:373:ARG:O	1:B:376:GLN:HG3	2.19	0.42
1:A:596:LYS:HE2	1:A:596:LYS:HB3	1.72	0.42
1:B:410:ASP:HB3	1:B:413:LEU:HG	2.00	0.42
1:B:585:MET:HB3	1:B:585:MET:HE3	1.77	0.42
1:A:427:LYS:O	1:A:429:GLN:HG3	2.19	0.42
1:B:379:LYS:HG3	1:B:543:VAL:CG2	2.50	0.41
1:B:351:ILE:HG12	1:B:360:TYR:CD2	2.55	0.41
1:B:514:ASN:ND2	3:B:814:HOH:O	2.52	0.41
1:A:491:PRO:HG3	1:A:501:TYR:CZ	2.56	0.41
1:A:575:MET:HE3	1:A:575:MET:HB2	1.90	0.41
1:A:578:ASP:OD1	1:A:578:ASP:N	2.54	0.41
1:B:561:ASP:CG	1:B:565:PHE:H	2.29	0.41
1:A:455:ILE:HD12	1:A:466:LEU:HD12	2.03	0.41
1:B:400:ILE:HG21	1:B:490:ALA:HB2	2.02	0.41
1:B:452:LEU:HD11	1:B:474:ILE:HG13	2.03	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	300/313 (96%)	282 (94%)	17 (6%)	1 (0%)	36 45

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	B	300/313 (96%)	292 (97%)	7 (2%)	1 (0%)	36	45
All	All	600/626 (96%)	574 (96%)	24 (4%)	2 (0%)	36	45

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	617	ASP
1	B	409	PRO

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	275/286 (96%)	266 (97%)	9 (3%)	33	50
1	B	275/286 (96%)	269 (98%)	6 (2%)	45	64
All	All	550/572 (96%)	535 (97%)	15 (3%)	39	58

All (15) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	408	THR
1	A	423	ILE
1	A	425	THR
1	A	426	THR
1	A	488	LEU
1	A	508	SER
1	A	552	THR
1	A	616	THR
1	A	618	ASN
1	B	332	LEU
1	B	368	SER
1	B	478	SER
1	B	598	ASP
1	B	632	ASP

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Mol	Chain	Res	Type
1	B	633	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (6) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	414	GLN
1	A	415	ASN
1	A	480	HIS
1	A	539	GLN
1	B	415	ASN
1	B	513	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 2 ligands modelled in this entry, 2 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 [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, 95th 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	302/313 (96%)	0.48	23 (7%) 20 19	33, 52, 93, 135	0
1	B	302/313 (96%)	0.26	10 (3%) 49 50	31, 46, 71, 98	0
All	All	604/626 (96%)	0.37	33 (5%) 30 30	31, 49, 88, 135	0

All (33) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	382	CYS	5.1
1	A	633	VAL	4.1
1	A	444	ILE	4.0
1	A	615	GLY	3.7
1	A	447	LEU	3.7
1	B	633	VAL	3.5
1	B	427	LYS	3.3
1	A	332	LEU	3.2
1	A	424	TRP	3.1
1	A	406	THR	3.1
1	B	374	LEU	2.8
1	A	480	HIS	2.7
1	A	404	GLY	2.6
1	A	426	THR	2.4
1	A	613	THR	2.4
1	B	385	CYS	2.4
1	A	405	ALA	2.4
1	A	432	ARG	2.4
1	A	375	PHE	2.3
1	A	434	VAL	2.3
1	A	614	ASN	2.3
1	A	423	ILE	2.3
1	A	428	ASN	2.2
1	A	558	TYR	2.2

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Mol	Chain	Res	Type	RSRZ
1	B	616	THR	2.1
1	A	407	LYS	2.1
1	A	374	LEU	2.1
1	B	614	ASN	2.1
1	A	619	GLN	2.0
1	B	332	LEU	2.0
1	A	522	THR	2.0
1	B	383	PRO	2.0
1	B	417	SER	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](#)

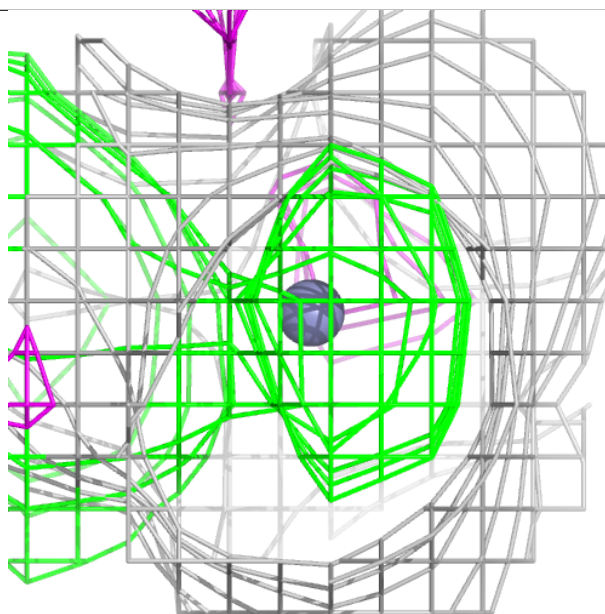
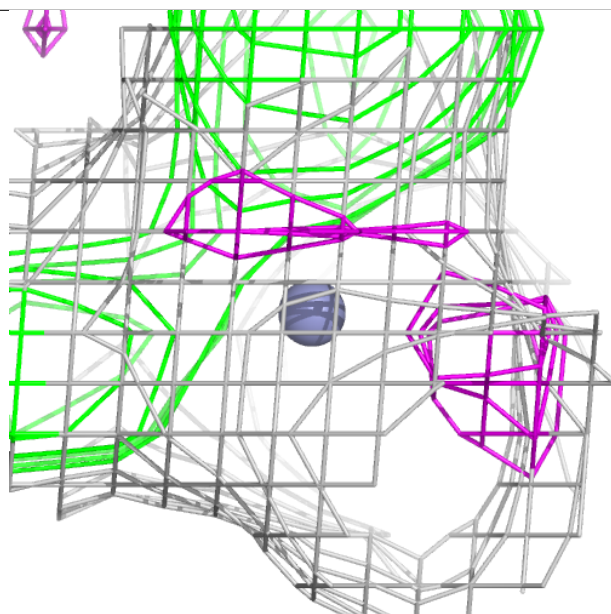
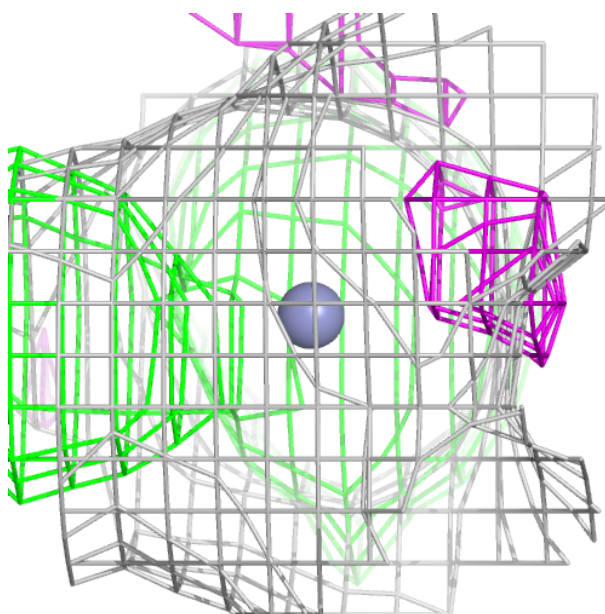
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists 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	700	1/1	0.86	0.09	56,56,56,56	0
2	ZN	A	700	1/1	0.98	0.03	55,55,55,55	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.

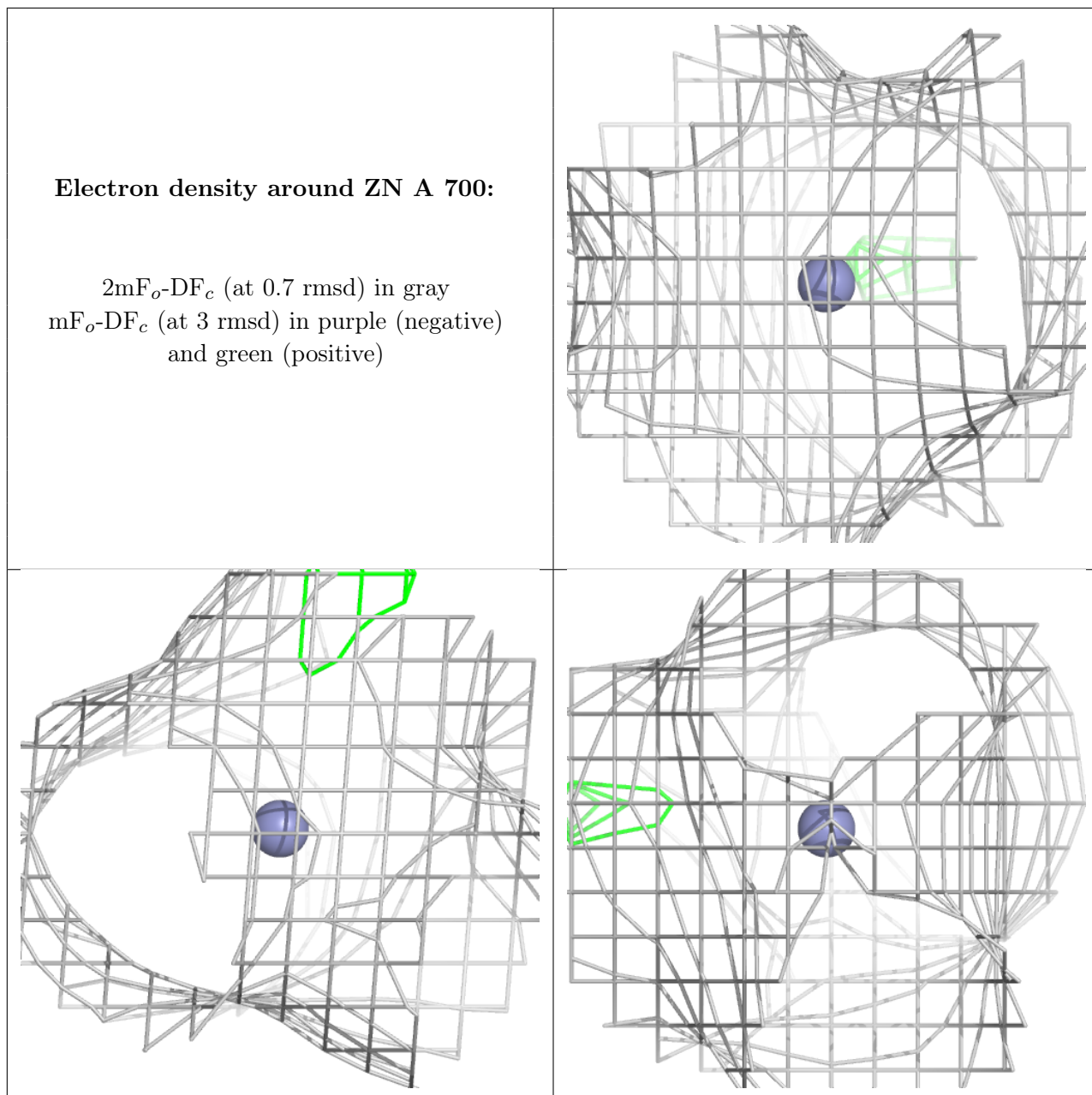
Electron density around ZN B 700:

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



Electron density around ZN A 700:

$2mF_o-DF_c$ (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.