



# Full wwPDB X-ray Structure Validation Report ⓘ

Jul 19, 2023 – 04:03 PM EDT

PDB ID : 6P3X  
Title : Crystal Structure of Full Length APOBEC3G E/Q (pH 7.0)  
Authors : Yang, H.J.; Li, S.X.; Chen, X.S.  
Deposited on : 2019-05-25  
Resolution : 2.40 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>.

---

The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4.02b-467  
Xtriage (Phenix) : 1.13  
EDS : 2.34  
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) : 2.34

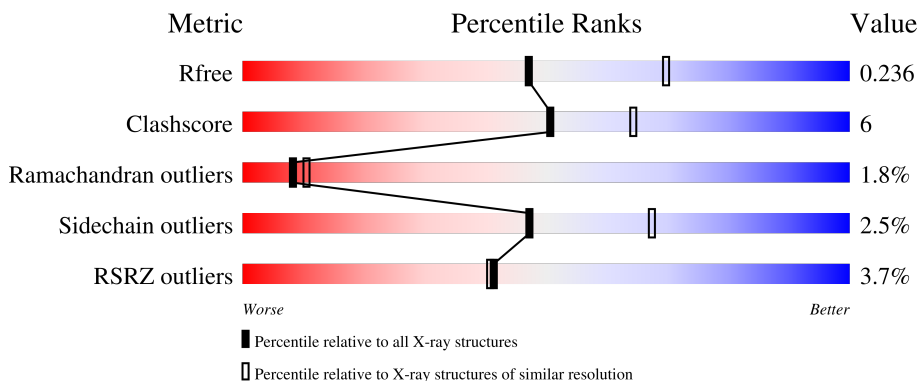
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.40 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))
$R_{free}$	130704	3907 (2.40-2.40)
Clashscore	141614	4398 (2.40-2.40)
Ramachandran outliers	138981	4318 (2.40-2.40)
Sidechain outliers	138945	4319 (2.40-2.40)
RSRZ outliers	127900	3811 (2.40-2.40)

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	386	 4% 80% 13% • 6%
1	B	386	 3% 81% 11% • 6%

## 2 Entry composition i

There are 3 unique types of molecules in this entry. The entry contains 6240 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 Apolipoprotein B mRNA editing enzyme, catalytic peptide-like 3G.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	362	3021	1941	531	528	21	0	0	0
1	B	362	3021	1941	531	528	21	0	0	0

There are 34 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-6	GLY	-	expression tag	UNP M1GSK9
A	-5	PRO	-	expression tag	UNP M1GSK9
A	-4	GLY	-	expression tag	UNP M1GSK9
A	-3	GLY	-	expression tag	UNP M1GSK9
A	-2	SER	-	expression tag	UNP M1GSK9
A	-1	GLY	-	expression tag	UNP M1GSK9
A	0	GLY	-	expression tag	UNP M1GSK9
A	128	ASP	LYS	linker	UNP M1GSK9
A	139	ALA	CYS	linker	UNP M1GSK9
A	140	GLU	GLN	linker	UNP M1GSK9
A	141	ALA	LYS	linker	UNP M1GSK9
A	142	GLY	ARG	linker	UNP M1GSK9
A	?	-	ASP	deletion	UNP M1GSK9
A	?	-	GLY	deletion	UNP M1GSK9
A	?	-	PRO	deletion	UNP M1GSK9
A	?	-	HIS	deletion	UNP M1GSK9
A	259	GLN	GLU	conflict	UNP M1GSK9
B	-6	GLY	-	expression tag	UNP M1GSK9
B	-5	PRO	-	expression tag	UNP M1GSK9
B	-4	GLY	-	expression tag	UNP M1GSK9
B	-3	GLY	-	expression tag	UNP M1GSK9
B	-2	SER	-	expression tag	UNP M1GSK9
B	-1	GLY	-	expression tag	UNP M1GSK9
B	0	GLY	-	expression tag	UNP M1GSK9

*Continued on next page...*

*Continued from previous page...*

Chain	Residue	Modelled	Actual	Comment	Reference
B	128	ASP	LYS	linker	UNP M1GSK9
B	139	ALA	CYS	linker	UNP M1GSK9
B	140	GLU	GLN	linker	UNP M1GSK9
B	141	ALA	LYS	linker	UNP M1GSK9
B	142	GLY	ARG	linker	UNP M1GSK9
B	?	-	ASP	deletion	UNP M1GSK9
B	?	-	GLY	deletion	UNP M1GSK9
B	?	-	PRO	deletion	UNP M1GSK9
B	?	-	HIS	deletion	UNP M1GSK9
B	259	GLN	GLU	conflict	UNP M1GSK9

- 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
2	B	1	Total Zn 1 1	0	0

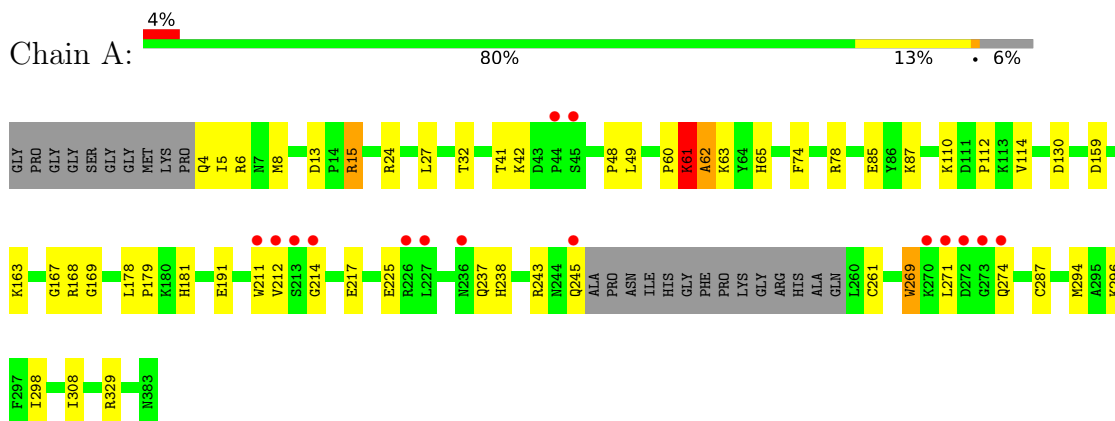
- Molecule 3 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	98	Total O 98 98	0	0
3	B	98	Total O 98 98	0	0

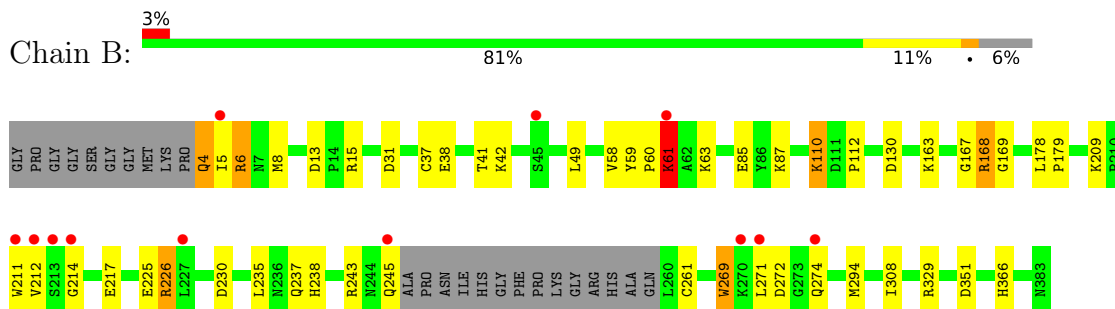
### 3 Residue-property plots [i](#)

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: Apolipoprotein B mRNA editing enzyme, catalytic peptide-like 3G



- Molecule 1: Apolipoprotein B mRNA editing enzyme, catalytic peptide-like 3G



## 4 Data and refinement statistics i

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	67.50Å 153.24Å 67.49Å 90.00° 114.87° 90.00°	Depositor
Resolution (Å)	47.84 – 2.40 47.84 – 2.40	Depositor EDS
% Data completeness (in resolution range)	97.8 (47.84-2.40) 97.8 (47.84-2.40)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	3.98 (at 2.39Å)	Xtrriage
Refinement program	PHENIX 1.14_3260	Depositor
R, $R_{free}$	0.189 , 0.237 0.190 , 0.236	Depositor DCC
$R_{free}$ test set	1993 reflections (4.21%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	37.4	Xtrriage
Anisotropy	0.646	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.34 , 32.6	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.50$ , $\langle L^2 \rangle = 0.34$	Xtrriage
Estimated twinning fraction	0.479 for l,-k,h	Xtrriage
$F_o, F_c$ correlation	0.95	EDS
Total number of atoms	6240	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	53.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.87% 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:  
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	0.30	0/3119	0.47	0/4232
1	B	0.30	0/3119	0.47	0/4232
All	All	0.30	0/6238	0.47	0/8464

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 [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	3021	0	2896	31	1
1	B	3021	0	2896	36	1
2	A	1	0	0	0	0
2	B	1	0	0	0	0
3	A	98	0	0	6	1
3	B	98	0	0	3	1
All	All	6240	0	5792	67	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 6.

All (67) 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:226:ARG:HD3	1:B:272:ASP:HB2	1.65	0.78
1:A:217:GLU:O	3:A:801:HOH:O	2.00	0.78
1:B:217:GLU:O	3:B:801:HOH:O	2.07	0.73
1:A:24:ARG:NH2	3:A:803:HOH:O	2.12	0.70
1:A:32:THR:O	3:A:802:HOH:O	2.12	0.68
1:B:351:ASP:OD1	3:B:802:HOH:O	2.14	0.65
1:B:130:ASP:OD1	1:B:243:ARG:NH1	2.28	0.65
1:A:60:PRO:O	1:A:61:LYS:HB2	1.97	0.64
1:A:298:ILE:O	3:A:804:HOH:O	2.16	0.62
1:A:217:GLU:HB3	1:A:245:GLN:HG3	1.81	0.62
1:B:237:GLN:HG2	1:B:238:HIS:ND1	2.14	0.62
1:B:60:PRO:O	1:B:61:LYS:HB2	2.00	0.61
1:B:42:LYS:HA	1:B:87:LYS:HD2	1.82	0.61
1:A:42:LYS:HE3	1:A:87:LYS:HZ3	1.67	0.59
1:A:24:ARG:HG3	1:A:181:HIS:CE1	2.37	0.59
1:A:211:TRP:NE1	1:A:214:GLY:O	2.29	0.58
1:A:225:GLU:OE2	3:A:805:HOH:O	2.17	0.58
1:B:5:ILE:HD12	1:B:163:LYS:HD2	1.86	0.57
1:B:4:GLN:O	1:B:8:MET:HG3	2.04	0.57
1:A:5:ILE:HD12	1:A:163:LYS:HD2	1.86	0.57
1:A:42:LYS:HD2	1:A:87:LYS:HG3	1.86	0.56
1:B:217:GLU:HB3	1:B:245:GLN:OE1	2.07	0.55
1:B:42:LYS:HD3	1:B:85:GLU:HB3	1.90	0.54
1:A:130:ASP:OD1	1:A:243:ARG:NH1	2.37	0.53
1:B:42:LYS:HE3	1:B:87:LYS:HZ3	1.75	0.52
1:A:167:GLY:O	1:A:169:GLY:N	2.41	0.52
1:B:13:ASP:OD2	1:B:15:ARG:HB2	2.10	0.52
1:B:167:GLY:O	1:B:169:GLY:N	2.43	0.51
1:B:209:LYS:HG2	1:B:366:HIS:CE1	2.46	0.51
1:B:5:ILE:HG22	1:B:5:ILE:O	2.13	0.49
1:A:41:THR:HG22	1:A:49:LEU:HD11	1.94	0.49
1:A:238:HIS:CD2	1:A:271:LEU:HD21	2.48	0.48
1:B:5:ILE:HD12	1:B:163:LYS:HE3	1.96	0.48
1:A:110:LYS:HD2	1:A:110:LYS:HA	1.68	0.47
1:A:294:MET:HE1	1:A:308:ILE:HD11	1.97	0.47
1:B:226:ARG:HG2	1:B:235:LEU:HD21	1.95	0.47
1:B:61:LYS:HA	1:B:61:LYS:HD3	1.41	0.46
1:A:8:MET:HE1	1:A:48:PRO:HB2	1.96	0.46
1:B:211:TRP:NE1	1:B:214:GLY:O	2.34	0.46
1:B:294:MET:HE1	1:B:308:ILE:HD11	1.97	0.46
1:A:114:VAL:O	3:A:806:HOH:O	2.20	0.46

*Continued on next page...*



Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:61:LYS:HD3	1:A:61:LYS:HA	1.41	0.45
1:B:225:GLU:OE2	3:B:803:HOH:O	2.21	0.45
1:A:112:PRO:HA	1:A:269:TRP:CE2	2.52	0.45
1:B:42:LYS:HE3	1:B:87:LYS:NZ	2.32	0.44
1:B:5:ILE:HD11	1:B:38:GLU:OE1	2.18	0.43
1:B:31:ASP:O	1:B:58:VAL:HG22	2.18	0.43
1:B:168:ARG:H	1:B:168:ARG:HG2	1.52	0.43
1:B:238:HIS:CD2	1:B:271:LEU:HD21	2.53	0.43
1:B:41:THR:HG22	1:B:49:LEU:HD11	2.01	0.43
1:A:27:LEU:HD12	1:A:27:LEU:HA	1.89	0.43
1:A:42:LYS:HD3	1:A:85:GLU:HB3	2.01	0.43
1:A:61:LYS:O	1:A:63:LYS:N	2.52	0.43
1:A:178:LEU:HB3	1:A:179:PRO:HD3	2.00	0.42
1:A:74:PHE:CE2	1:A:78:ARG:HD2	2.54	0.42
1:B:5:ILE:HG22	1:B:163:LYS:O	2.19	0.42
1:B:110:LYS:HD2	1:B:110:LYS:HA	1.78	0.42
1:A:62:ALA:HA	1:A:65:HIS:CD2	2.55	0.41
1:B:112:PRO:HA	1:B:269:TRP:CD2	2.56	0.41
1:B:61:LYS:O	1:B:63:LYS:N	2.54	0.41
1:B:178:LEU:HB3	1:B:179:PRO:HD3	2.02	0.41
1:A:159:ASP:O	1:A:163:LYS:HG3	2.21	0.41
1:B:4:GLN:N	1:B:6:ARG:HH11	2.18	0.41
1:B:42:LYS:HA	1:B:42:LYS:HD2	1.88	0.41
1:A:112:PRO:HA	1:A:269:TRP:CD2	2.56	0.40
1:B:59:TYR:HB2	1:B:60:PRO:HD2	2.03	0.40
1:A:13:ASP:OD2	1:A:15:ARG:HB2	2.21	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)
1:A:4:GLN:NE2	1:B:4:GLN:OE1[2_555]	1.99	0.21
3:A:876:HOH:O	3:B:847:HOH:O[1_554]	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	358/386 (93%)	337 (94%)	14 (4%)	7 (2%)	7	9
1	B	358/386 (93%)	336 (94%)	16 (4%)	6 (2%)	9	11
All	All	716/772 (93%)	673 (94%)	30 (4%)	13 (2%)	8	10

All (13) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	61	LYS
1	A	168	ARG
1	A	274	GLN
1	B	61	LYS
1	B	168	ARG
1	B	274	GLN
1	A	269	TRP
1	B	269	TRP
1	A	261	CYS
1	B	261	CYS
1	A	62	ALA
1	A	212	VAL
1	B	212	VAL

### 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	325/340 (96%)	317 (98%)	8 (2%)	47	67
1	B	325/340 (96%)	317 (98%)	8 (2%)	47	67
All	All	650/680 (96%)	634 (98%)	16 (2%)	47	67

All (16) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	6	ARG
1	A	15	ARG
1	A	61	LYS
1	A	191	GLU
1	A	237	GLN
1	A	287	CYS
1	A	296	LYS
1	A	329	ARG
1	B	4	GLN
1	B	6	ARG
1	B	37	CYS
1	B	61	LYS
1	B	110	LYS
1	B	226	ARG
1	B	230	ASP
1	B	329	ARG

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	229	ASN

### 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 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

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	362/386 (93%)	0.04	15 (4%) 37 36	24, 50, 93, 124	0
1	B	362/386 (93%)	0.04	12 (3%) 46 45	23, 50, 92, 122	0
All	All	724/772 (93%)	0.04	27 (3%) 41 41	23, 50, 93, 124	0

All (27) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	214	GLY	8.4
1	A	214	GLY	5.4
1	A	271	LEU	4.8
1	A	245	GLN	4.5
1	B	271	LEU	4.4
1	A	211	TRP	3.8
1	B	212	VAL	3.7
1	A	273	GLY	3.6
1	B	213	SER	3.5
1	A	45	SER	3.5
1	A	212	VAL	3.2
1	A	236	ASN	3.2
1	B	211	TRP	3.1
1	B	245	GLN	3.0
1	B	45	SER	3.0
1	B	274	GLN	2.9
1	B	270	LYS	2.9
1	A	44	PRO	2.7
1	A	270	LYS	2.6
1	A	272	ASP	2.5
1	B	227	LEU	2.4
1	A	227	LEU	2.3
1	B	5	ILE	2.3
1	A	213	SER	2.2

*Continued on next page...*

*Continued from previous page...*

Mol	Chain	Res	Type	RSRZ
1	A	226	ARG	2.1
1	A	274	GLN	2.1
1	B	61	LYS	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 monosaccharides in this entry.

## 6.4 Ligands [i](#)

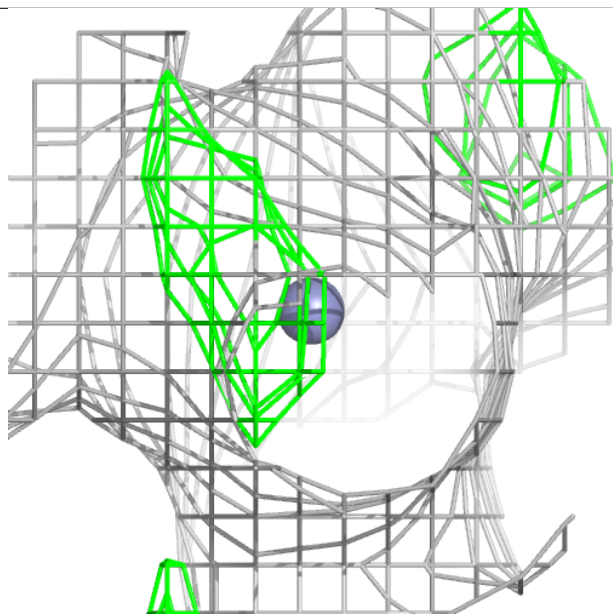
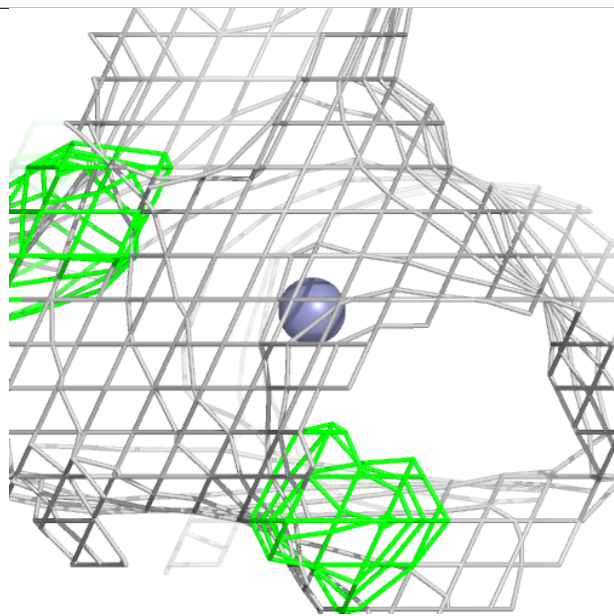
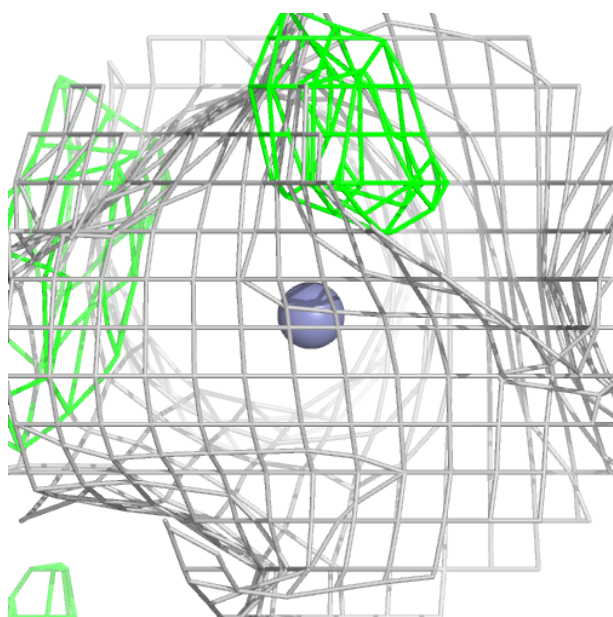
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95<sup>th</sup> percentile and maximum values of B factors of atoms in the group. The column labelled 'Q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

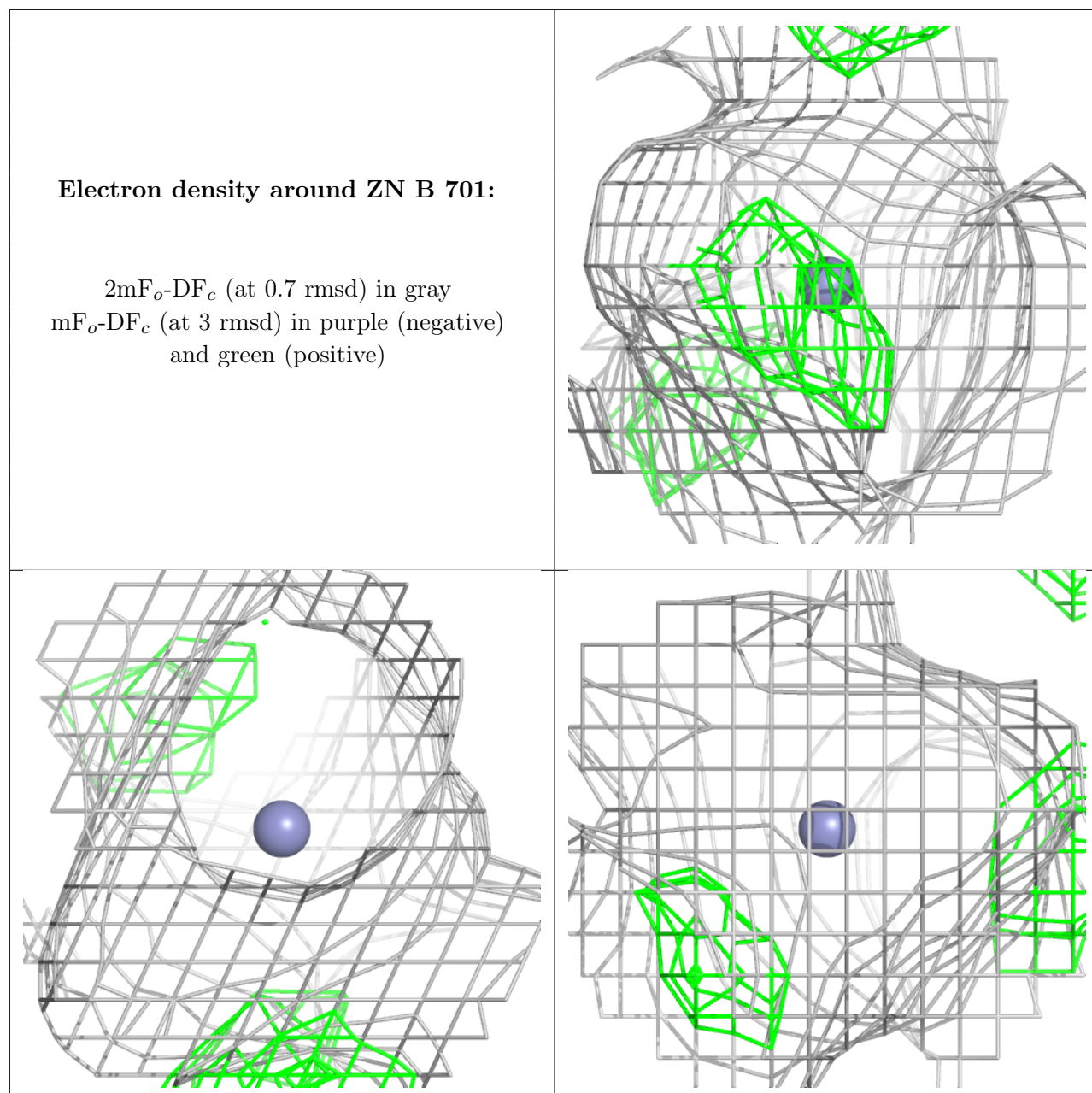
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å <sup>2</sup> )	Q<0.9
2	ZN	A	701	1/1	1.00	0.16	41,41,41,41	0
2	ZN	B	701	1/1	1.00	0.17	38,38,38,38	0

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.