



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 6, 2026 – 03:49 PM UTC

PDB ID : 6M3T / pdb_00006m3t
Title : Crystal structure of the mouse endonuclease EndoG(H138A/C110A), space group P41212
Authors : Park, K.H.; Woo, E.J.
Deposited on : 2020-03-04
Resolution : 2.38 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

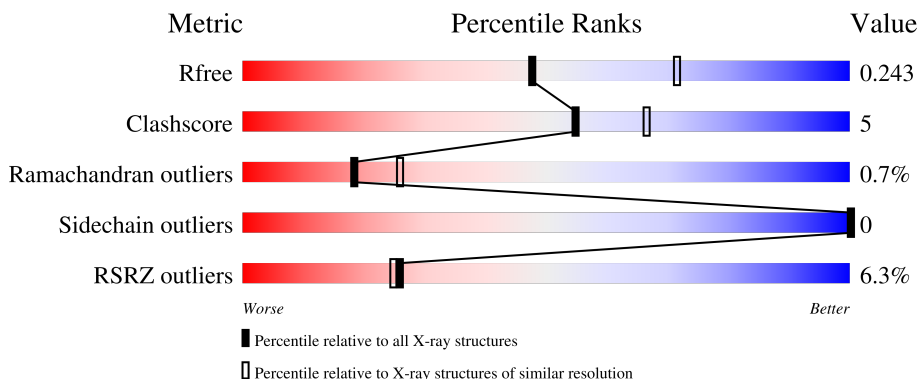
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

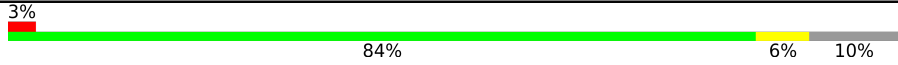
The reported resolution of this entry is 2.38 Å.

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	7164 (2.40-2.36)
Clashscore	190562	7722 (2.40-2.36)
Ramachandran outliers	187476	7626 (2.40-2.36)
Sidechain outliers	187428	7627 (2.40-2.36)
RSRZ outliers	180081	7170 (2.40-2.36)

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	249	
1	B	249	

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 3767 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 Endonuclease G, mitochondrial.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	224	Total	C	N	O	S	0	0	0
			1789	1129	329	328	3			
1	B	223	Total	C	N	O	S	0	0	0
			1780	1124	328	325	3			

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	110	ALA	CYS	engineered mutation	UNP O08600
A	138	ALA	HIS	engineered mutation	UNP O08600
B	110	ALA	CYS	engineered mutation	UNP O08600
B	138	ALA	HIS	engineered mutation	UNP O08600

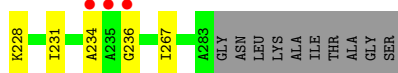
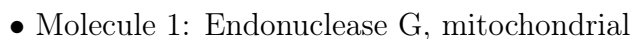
- Molecule 2 is MAGNESIUM ION (CCD ID: MG) (formula: Mg) (labeled as "Ligand of Interest" by depositor).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	1	Total	Mg	0	0
			1	1		
2	B	1	Total	Mg	0	0
			1	1		

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	88	Total	O	0	0
			88	88		
3	B	108	Total	O	0	0
			108	108		

- Molecule 1: Endonuclease G, mitochondrial



4 Data and refinement statistics

Property	Value	Source
Space group	P 41 21 2	Depositor
Cell constants a, b, c, α , β , γ	68.59Å 68.59Å 251.32Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	45.25 – 2.38 45.25 – 2.38	Depositor EDS
% Data completeness (in resolution range)	100.0 (45.25-2.38) 99.9 (45.25-2.38)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.10	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.42 (at 2.39Å)	Xtriage
Refinement program	PHENIX 1.16_3549	Depositor
R, R_{free}	0.202 , 0.244 0.203 , 0.243	Depositor DCC
R_{free} test set	1263 reflections (5.04%)	wwPDB-VP
Wilson B-factor (Å ²)	24.4	Xtriage
Anisotropy	0.416	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 31.8	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.93	EDS
Total number of atoms	3767	wwPDB-VP
Average B, all atoms (Å ²)	28.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.84% 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: MG

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	0.16	0/1833	0.32	0/2492
1	B	0.20	0/1824	0.42	0/2480
All	All	0.18	0/3657	0.38	0/4972

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

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	1
1	B	0	7
All	All	0	8

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (8) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	234	ALA	Peptide
1	B	100	ARG	Peptide
1	B	105	GLY	Peptide
1	B	106	ASP	Peptide
1	B	234	ALA	Peptide
1	B	236	GLY	Peptide
1	B	98	PRO	Peptide
1	B	99	GLU	Peptide

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	1789	0	1750	10	0
1	B	1780	0	1744	26	0
2	A	1	0	0	0	0
2	B	1	0	0	0	0
3	A	88	0	0	1	0
3	B	108	0	0	1	0
All	All	3767	0	3494	34	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 5.

All (34) 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:99:GLU:C	1:B:101:LEU:HD23	1.81	1.05
1:B:105:GLY:O	1:B:107:ARG:HG2	1.74	0.85
1:B:99:GLU:C	1:B:101:LEU:CD2	2.55	0.79
1:B:99:GLU:HB3	1:B:101:LEU:HD23	1.68	0.75
1:B:100:ARG:O	1:B:102:ARG:N	2.25	0.68
1:B:99:GLU:HB3	1:B:101:LEU:CD2	2.31	0.60
1:B:99:GLU:CB	1:B:101:LEU:HD23	2.30	0.60
1:A:243:SER:HB3	1:A:267:ILE:HD12	1.85	0.57
1:B:107:ARG:O	1:B:149:GLN:NE2	2.36	0.56
1:A:201:ARG:HG2	1:A:201:ARG:HH11	1.70	0.56
1:B:61:LEU:C	1:B:61:LEU:HD13	2.31	0.55
1:B:100:ARG:N	1:B:101:LEU:HD23	2.21	0.54
1:B:99:GLU:CA	1:B:101:LEU:HD23	2.36	0.53
1:B:99:GLU:O	1:B:101:LEU:CD2	2.57	0.52
1:B:99:GLU:O	1:B:101:LEU:HD22	2.09	0.52
1:A:85:ARG:HH22	1:B:85:ARG:NH2	2.09	0.51
1:B:227:PHE:HB2	1:B:267:ILE:HD13	1.93	0.50
1:B:104:ASP:HB2	1:B:147:TRP:HA	1.93	0.50
1:B:99:GLU:OE1	1:B:184:THR:OG1	2.24	0.49
1:B:192:VAL:HG11	1:B:228:LYS:HE3	1.95	0.48
1:B:100:ARG:HH11	1:B:102:ARG:HB3	1.78	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:191:TYR:HB2	1:B:231:ILE:HB	1.97	0.46
1:B:97:ARG:HG2	3:B:427:HOH:O	2.15	0.46
1:B:78:TYR:HE1	1:B:80:LEU:HD23	1.80	0.44
1:B:78:TYR:CE1	1:B:80:LEU:HD23	2.52	0.44
1:A:244:TYR:OH	3:A:401:HOH:O	2.20	0.43
1:B:107:ARG:HD3	1:B:107:ARG:HA	1.52	0.43
1:B:107:ARG:HB3	1:B:152:MET:SD	2.60	0.42
1:A:83:ASP:HB2	1:A:90:LEU:HG	2.01	0.42
1:A:201:ARG:HG2	1:A:201:ARG:NH1	2.35	0.42
1:A:78:TYR:CE1	1:A:80:LEU:HD23	2.55	0.41
1:A:252:ASP:HB3	1:A:255:ILE:HG13	2.01	0.41
1:A:67:PRO:HD2	1:B:91:TRP:CZ2	2.55	0.41
1:A:92:VAL:O	1:A:193:CYS:HA	2.20	0.40

There are no symmetry-related clashes.

5.3 Torsion angles ⓘ

5.3.1 Protein backbone ⓘ

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	222/249 (89%)	217 (98%)	5 (2%)	0	100	100
1	B	221/249 (89%)	206 (93%)	12 (5%)	3 (1%)	9	11
All	All	443/498 (89%)	423 (96%)	17 (4%)	3 (1%)	18	26

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	101	LEU
1	B	105	GLY
1	B	106	ASP

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	186/199 (94%)	186 (100%)	0	100	100
1	B	185/199 (93%)	185 (100%)	0	100	100
All	All	371/398 (93%)	371 (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 (4) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	171	ASN
1	A	213	GLN
1	B	170	GLN
1	B	188	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 oligosaccharides 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 [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	224/249 (89%)	0.05	8 (3%) 46 46	16, 23, 47, 75	0
1	B	223/249 (89%)	0.32	20 (8%) 15 14	15, 22, 60, 140	0
All	All	447/498 (89%)	0.19	28 (6%) 26 25	15, 23, 52, 140	0

All (28) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	101	LEU	8.6
1	B	103	GLY	8.4
1	B	105	GLY	7.6
1	B	108	SER	7.0
1	B	106	ASP	6.7
1	B	235	ALA	6.5
1	A	69	VAL	6.4
1	B	109	ALA	6.4
1	B	61	LEU	6.0
1	A	283	ALA	5.6
1	B	104	ASP	5.2
1	B	99	GLU	5.2
1	B	107	ARG	4.9
1	B	100	ARG	4.8
1	B	102	ARG	4.3
1	B	69	VAL	4.1
1	B	70	ALA	4.0
1	A	235	ALA	3.8
1	A	70	ALA	3.7
1	B	234	ALA	3.7
1	B	62	ALA	3.4
1	A	71	GLN	2.9
1	A	282	ARG	2.8
1	A	281	ALA	2.7

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Mol	Chain	Res	Type	RSRZ
1	B	236	GLY	2.7
1	A	236	GLY	2.5
1	B	64	TYR	2.3
1	B	217	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 oligosaccharides in this entry.

6.4 Ligands [i](#)

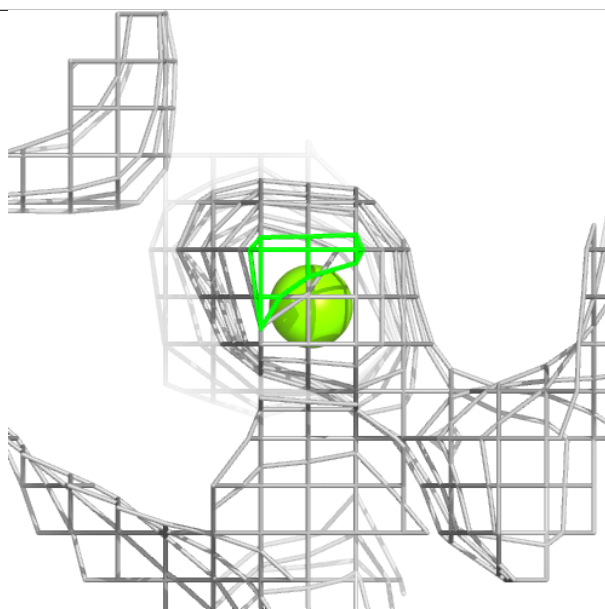
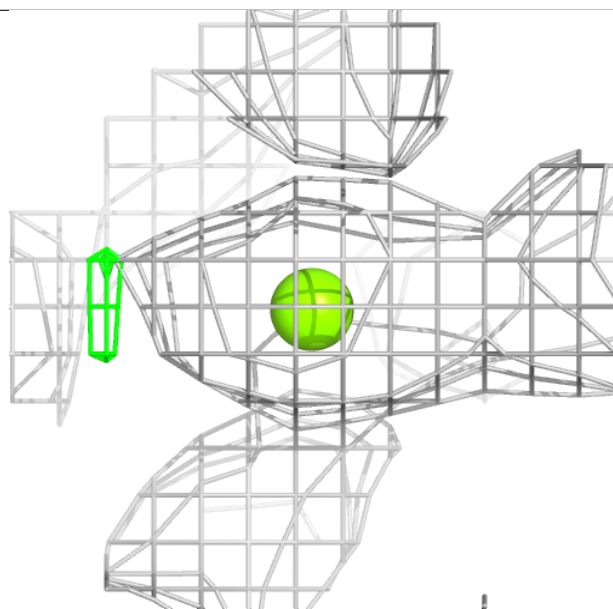
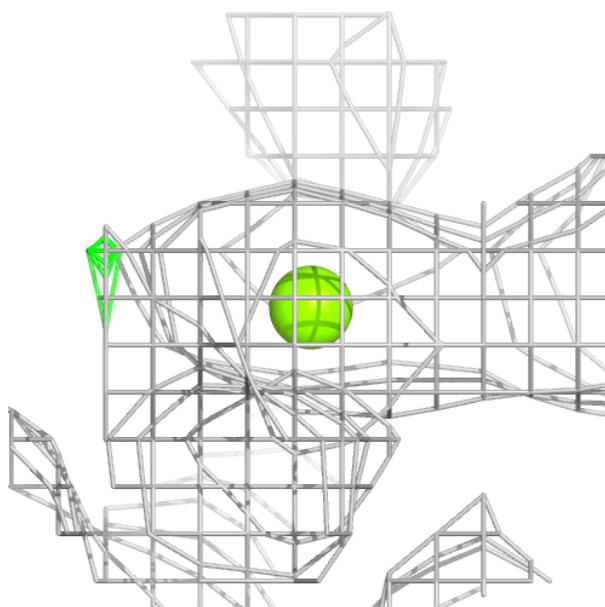
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

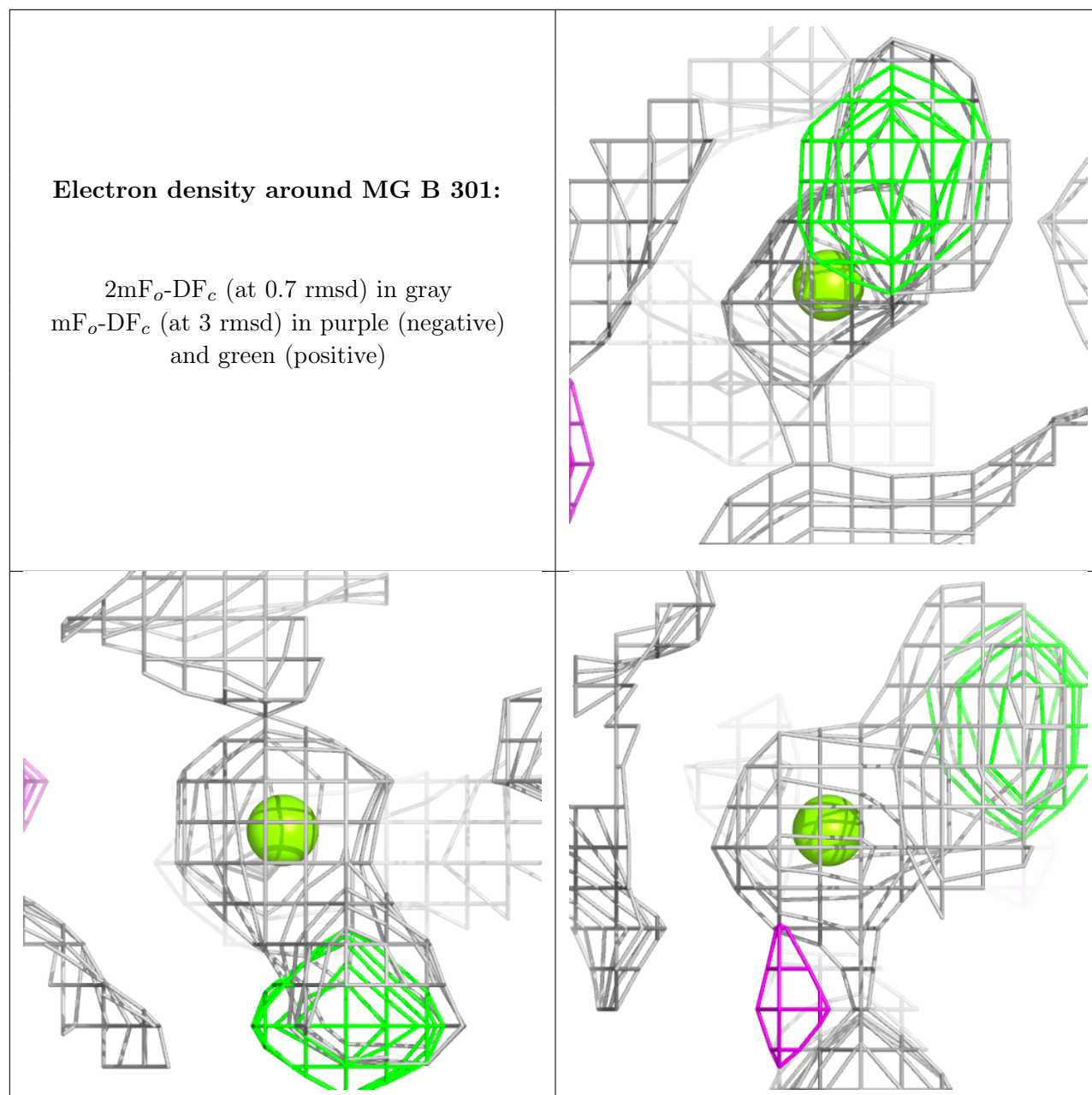
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
2	MG	A	301	1/1	0.81	0.12	46,46,46,46	0
2	MG	B	301	1/1	0.89	0.26	58,58,58,58	0

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 MG 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.