wwPDB X-ray Structure Validation Summary Report (i)

Mar 9, 2026 – 11:09 AM UTC

PDB ID	:	8QRZ / pdb_00008qrz
Title	:	Microbacterium testaceum C-glucosyl deglycosidase (CGD), wild type
Authors	:	Furlanetto, V.; Kalyani, D.C.; Divne, C.
Deposited on	:	2023-10-09
Resolution	:	2.00 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 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:

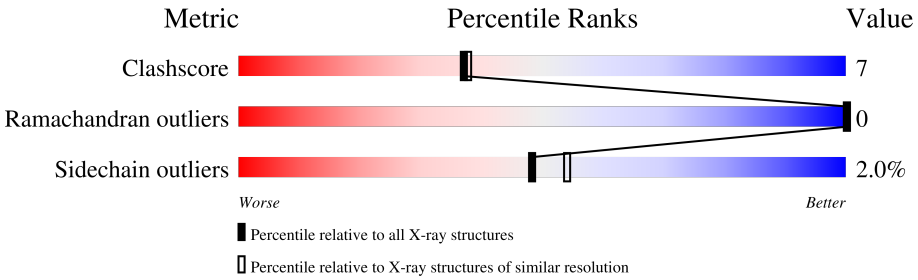
MolProbity	:	4-5-2 with Phenix2.0
Mogul	:	NOT EXECUTED
Xtriage (Phenix)	:	2.0
EDS	:	NOT EXECUTED
Buster-report	:	NOT EXECUTED
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

1 Overall quality at a glance (i)

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

The reported resolution of this entry is 2.00 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))
Clashscore	190562	11152 (2.00-2.00)
Ramachandran outliers	187476	11031 (2.00-2.00)
Sidechain outliers	187428	11029 (2.00-2.00)

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%

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	435	84% 15%
1	B	435	87% 12%
1	C	435	81% 18%
1	D	435	80% 19%

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
2	RB	A	501	-	-	X	-
2	RB	B	501	-	-	X	-
2	RB	C	501	-	-	X	-

2 Entry composition (i)

There are 3 unique types of molecules in this entry. The entry contains 14165 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 Sugar phosphate isomerase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	435	Total	C	N	O	S	0	1	0
			3451	2203	592	646	10			
1	B	435	Total	C	N	O	S	0	1	0
			3448	2202	591	645	10			
1	C	435	Total	C	N	O	S	0	1	0
			3448	2202	591	645	10			
1	D	435	Total	C	N	O	S	0	0	0
			3440	2197	588	645	10			

There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	434	ALA	-	expression tag	UNP A0A147EV52
A	435	GLU	-	expression tag	UNP A0A147EV52
B	434	ALA	-	expression tag	UNP A0A147EV52
B	435	GLU	-	expression tag	UNP A0A147EV52
C	434	ALA	-	expression tag	UNP A0A147EV52
C	435	GLU	-	expression tag	UNP A0A147EV52
D	434	ALA	-	expression tag	UNP A0A147EV52
D	435	GLU	-	expression tag	UNP A0A147EV52

- Molecule 2 is RUBIDIUM ION (CCD ID: RB) (formula: Rb) (labeled as "Ligand of Interest" by depositor).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	1	Total	Rb	0	0
			1	1		
2	B	1	Total	Rb	0	0
			1	1		
2	C	1	Total	Rb	0	0
			1	1		
2	D	1	Total	Rb	0	0
			1	1		

- Molecule 3 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	99	Total O 99 99	0	0
3	B	104	Total O 104 104	0	0
3	C	84	Total O 84 84	0	0
3	D	87	Total O 87 87	0	0

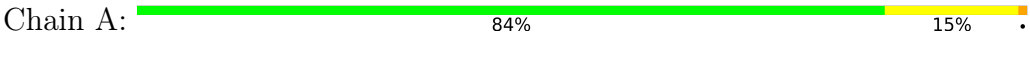
3 Residue-property plots (i)

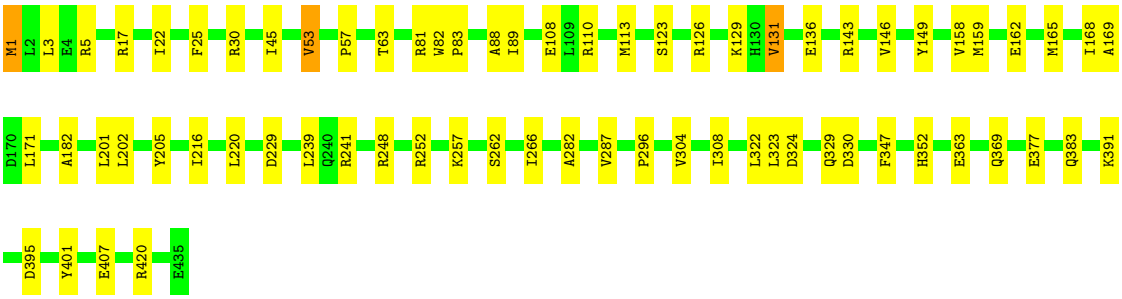
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry. Residues are color-coded 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. 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.

Note EDS was not executed.

• Molecule 1: Sugar phosphate isomerase

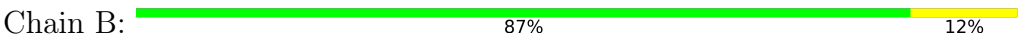
Chain A:

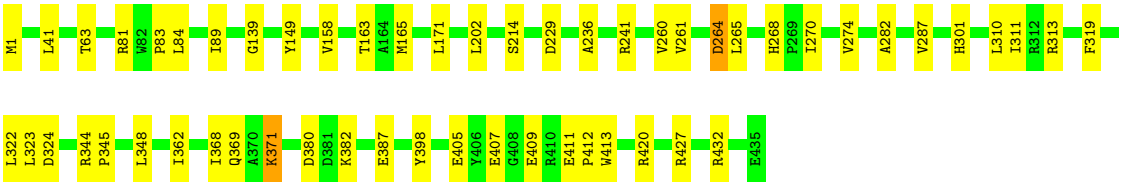




• Molecule 1: Sugar phosphate isomerase

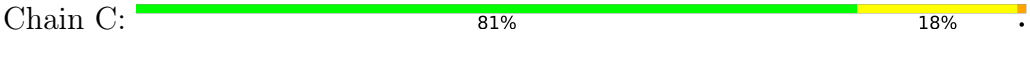
Chain B:

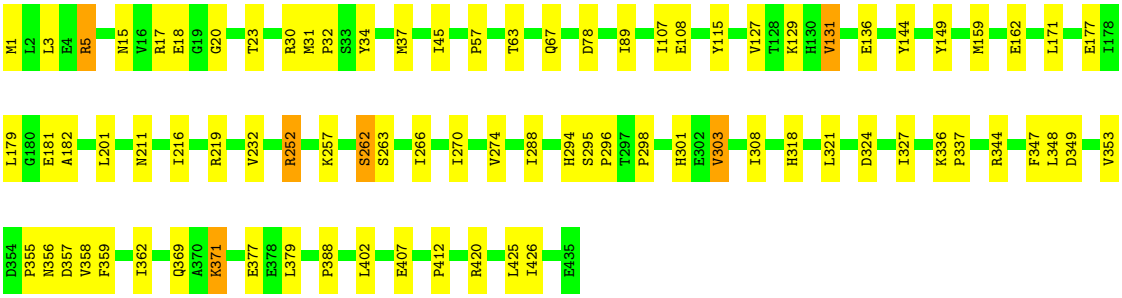




• Molecule 1: Sugar phosphate isomerase

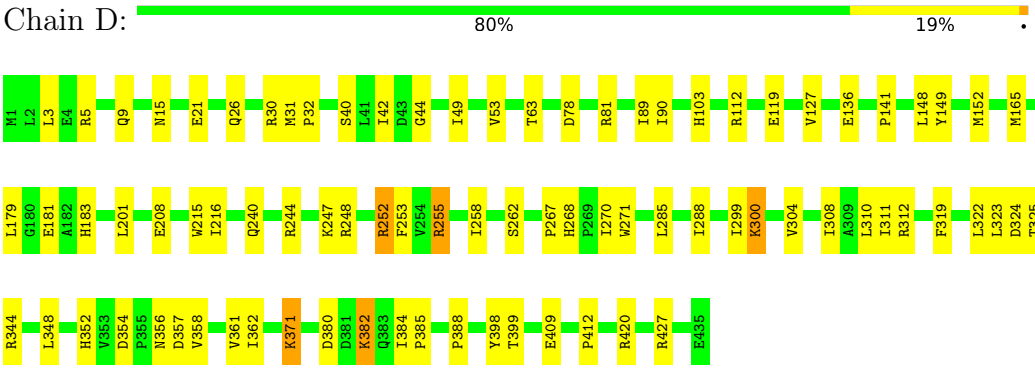
Chain C:





• Molecule 1: Sugar phosphate isomerase

Chain D:


80%
19%
M1 L2 L3 E4 R5 Q9 N15 E21 Q26 R30 M31 P32 S40 L41 I42 D43 G44 I49 V53 T63 D78 R81 I89 I90 H103 R112 E119 V127 E136 P141 L148 Y149 M152 M165 L171 T174
L179 G180 E181 A182 H183 L201 E208 W215 I216 Q240 R244 K247 R248 R252 F253 V254 R255 I258 S262 P267 H268 P269 I270 W271 L285 I288 I299 K300 V304 I308 A309 L310 I311 R312 F319 L322 L323 D324 T325 L340 Q343
R344 L348 H352 V353 D354 P355 N356 D357 V358 V361 I362 K371 D380 D381 K382 Q383 I384 P385 P388 Y398 T399 E409 P412 R420 R427 E435

4 Data and refinement statistics (i)

EDS was not executed - this section is therefore incomplete.

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, α, β, γ	78.22Å 80.41Å 82.96Å 90.17° 94.39° 106.58°	Depositor
Resolution (Å)	39.91 – 2.00	Depositor
% Data completeness (in resolution range)	98.8 (39.91-2.00)	Depositor
R_{merge}	0.11	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.50 (at 2.00Å)	Xtriage
Refinement program	PHENIX 1.19.2_4158	Depositor
R, R_{free}	0.236 , 0.290	Depositor
Wilson B-factor (Å^2)	31.5	Xtriage
Anisotropy	0.230	Xtriage
L-test for twinning[2]	$< \|L\| > = 0.47$, $< L^2 > = 0.30$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	14165	wwPDB-VP
Average B, all atoms (Å^2)	35.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.91% 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: RB

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	0.38	0/3541	0.58	0/4825
1	B	0.38	0/3541	0.59	1/4825 (0.0%)
1	C	0.38	1/3541 (0.0%)	0.57	1/4825 (0.0%)
1	D	0.41	0/3530	0.63	0/4811
All	All	0.39	1/14153 (0.0%)	0.59	2/19286 (0.0%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	C	252	ARG	CA-C	5.82	1.60	1.52

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	C	252	ARG	CA-C-O	6.25	126.58	119.27
1	B	264	ASP	N-CA-C	-5.47	106.64	113.15

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	3451	0	3396	45	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	B	3448	0	3397	37	0
1	C	3448	0	3397	58	0
1	D	3440	0	3384	63	0
2	A	1	0	0	4	0
2	B	1	0	0	3	0
2	C	1	0	0	3	0
2	D	1	0	0	1	0
3	A	99	0	0	4	0
3	B	104	0	0	3	0
3	C	84	0	0	6	0
3	D	87	0	0	7	0
All	All	14165	0	13574	195	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.

The worst 5 of 195 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:C:219:ARG:O	1:D:112:ARG:NH1	2.06	0.88
1:D:40:SER:O	1:D:112:ARG:NH2	2.13	0.82
1:B:165:MET:HE1	1:B:202:LEU:HA	1.63	0.80
1:A:5:ARG:O	1:A:30:ARG:NH1	2.16	0.79
1:B:369:GLN:OE1	2:B:501:RB:RB	2.10	0.78

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	434/435 (100%)	411 (95%)	23 (5%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	B	434/435 (100%)	414 (95%)	20 (5%)	0	100	100
1	C	434/435 (100%)	413 (95%)	21 (5%)	0	100	100
1	D	433/435 (100%)	409 (94%)	24 (6%)	0	100	100
All	All	1735/1740 (100%)	1647 (95%)	88 (5%)	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	372/371 (100%)	366 (98%)	6 (2%)	55	62
1	B	372/371 (100%)	368 (99%)	4 (1%)	65	73
1	C	372/371 (100%)	365 (98%)	7 (2%)	50	56
1	D	371/371 (100%)	359 (97%)	12 (3%)	34	35
All	All	1487/1484 (100%)	1458 (98%)	29 (2%)	48	54

5 of 29 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	263	SER
1	D	384	ILE
1	D	21	GLU
1	D	323	LEU
1	C	371	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 10 such sidechains are listed below:

Mol	Chain	Res	Type
1	D	356	ASN
1	D	364	ASN
1	D	428	GLN

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Mol	Chain	Res	Type
1	B	211	ASN
1	C	294	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)

Mogul was not executed - this section is therefore empty.

5.5 Carbohydrates (i)

Mogul was not executed - this section is therefore empty.

5.6 Ligand geometry (i)

Mogul was not executed - this section is therefore empty.

5.7 Other polymers (i)

Mogul was not executed - this section is therefore empty.

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

EDS was not executed - this section is therefore empty.

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

EDS was not executed - this section is therefore empty.

6.3 Carbohydrates

EDS was not executed - this section is therefore empty.

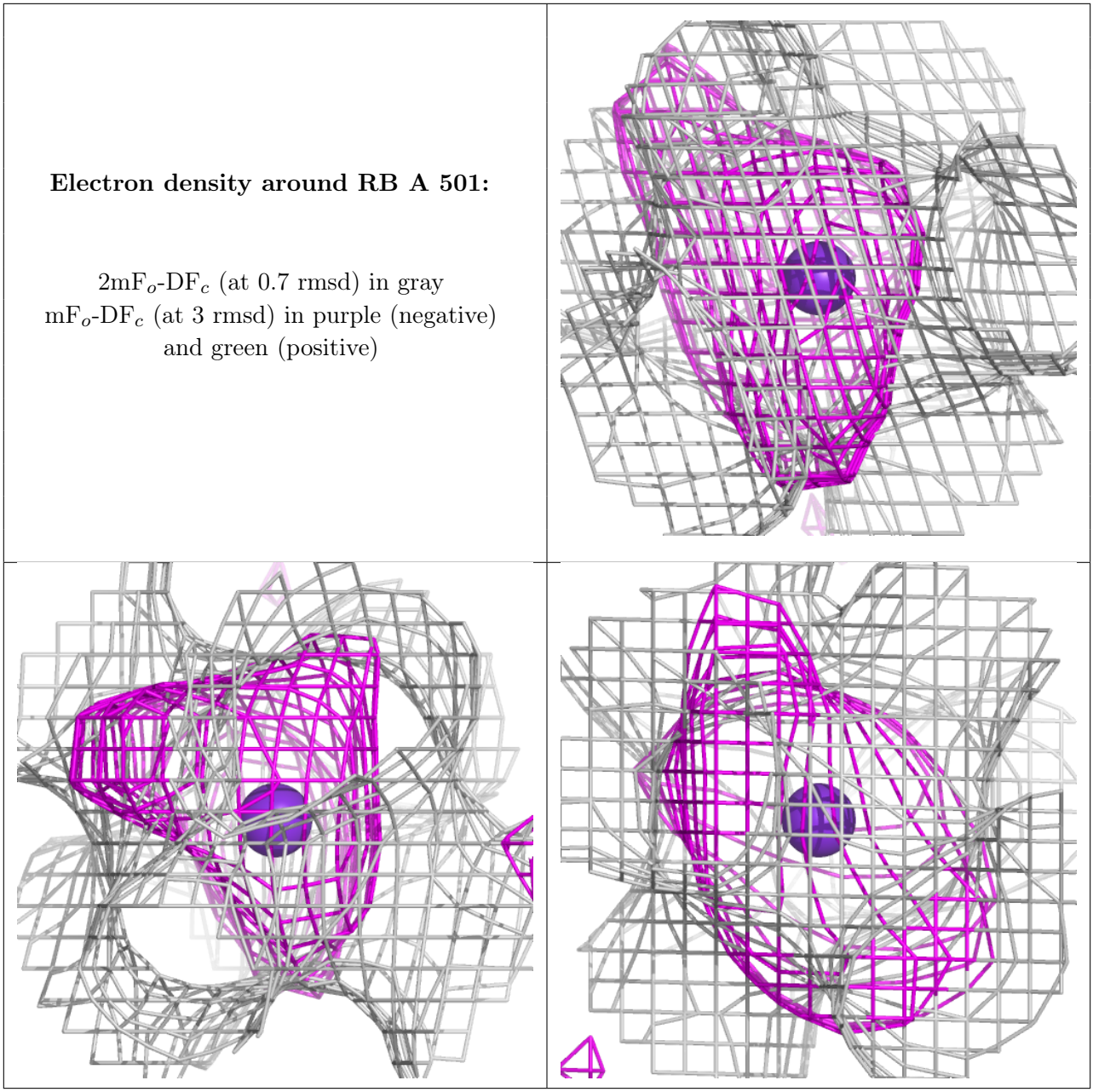
6.4 Ligands

EDS was not executed - this section is therefore empty.

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.

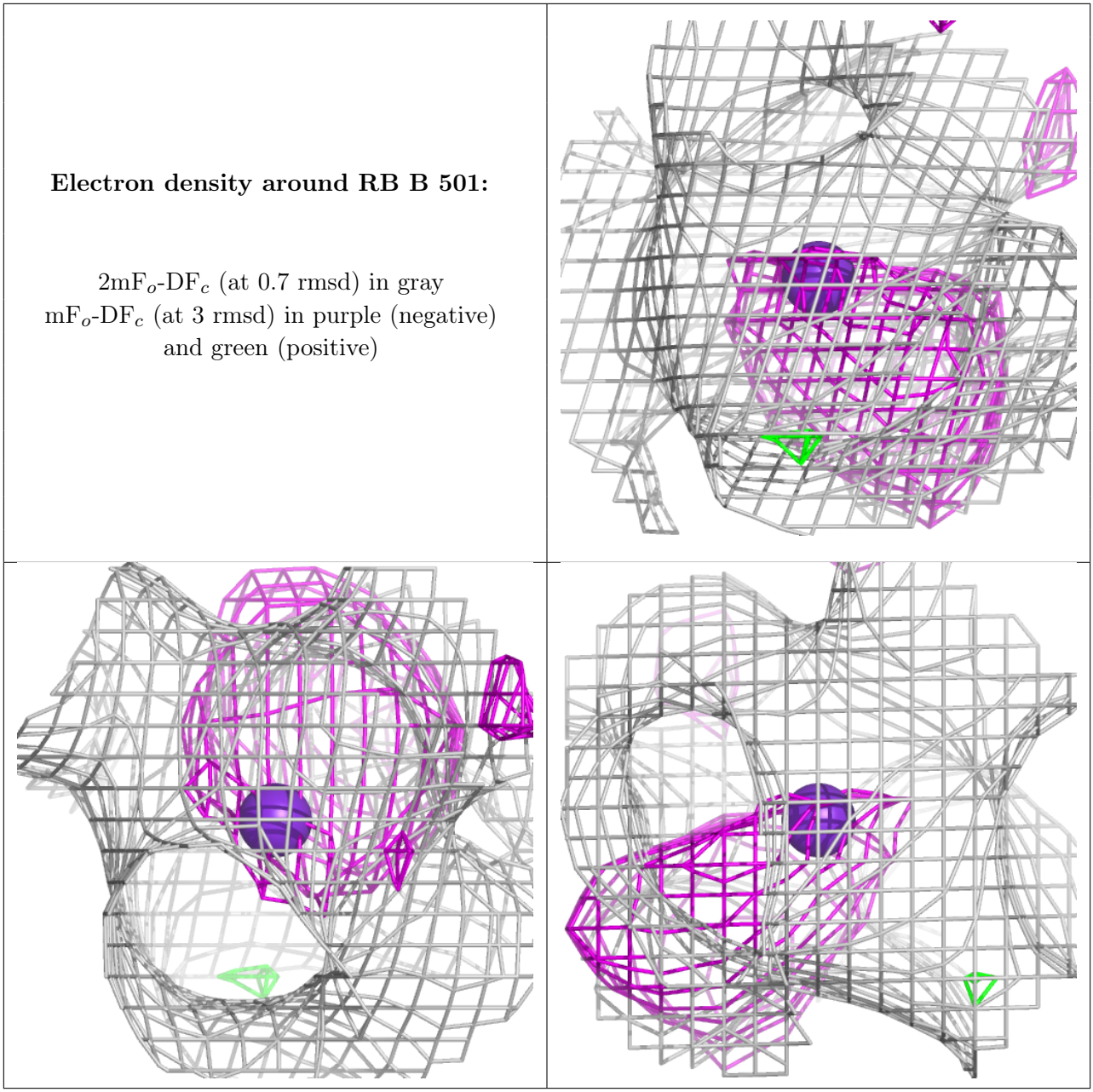
Electron density around RB A 501:

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



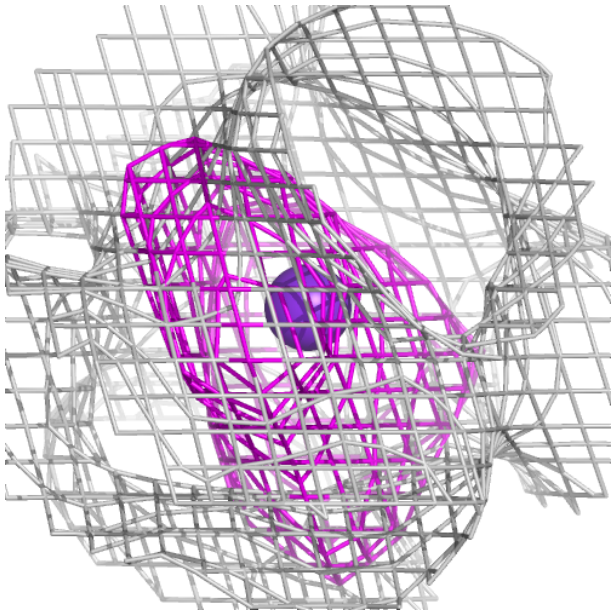
Electron density around RB B 501:

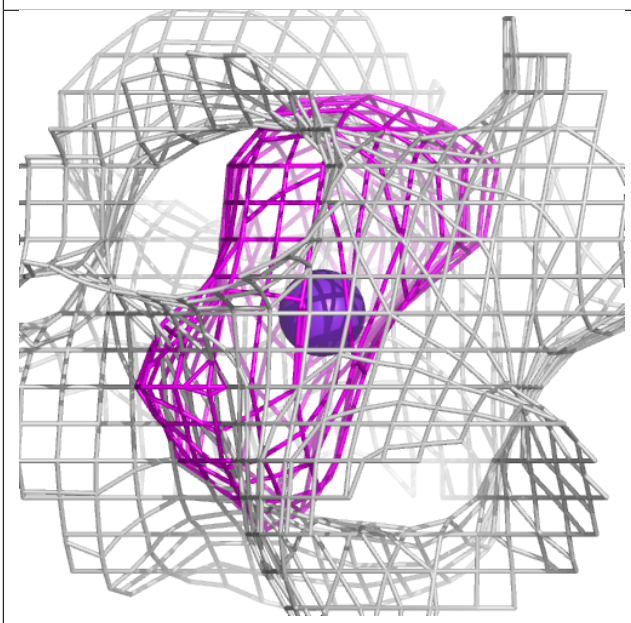
$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)

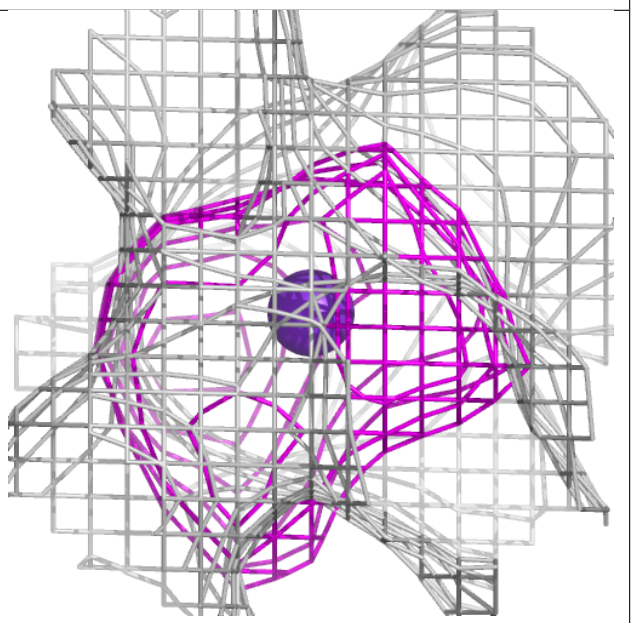


Electron density around RB C 501:

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

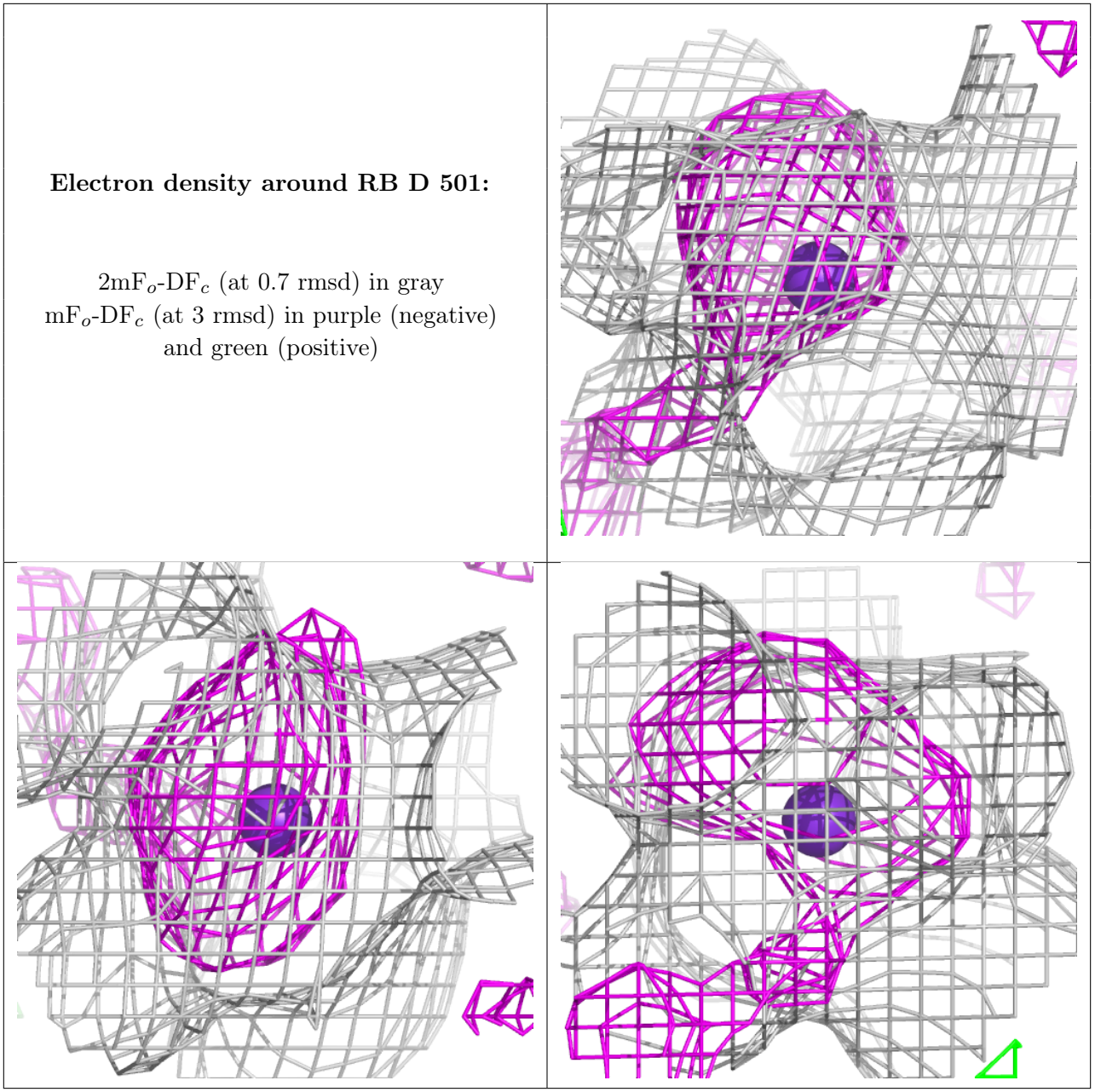






Electron density around RB D 501:

$2mF_o$-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

EDS was not executed - this section is therefore empty.