



# Full wwPDB X-ray Structure Validation Report ⓘ

Nov 29, 2023 – 03:30 pm GMT

PDB ID : 8ORU  
Title : cyclic 2,3-diphosphoglycerate synthetase from the hyperthermophilic archaeon Methanothermus fervidus bound to 2,3-diphosphoglycerate and ADP.  
Authors : De Rose, S.A.; Isupov, M.  
Deposited on : 2023-04-17  
Resolution : 2.23 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>.

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

MolProbity : 4.02b-467  
Mogul : 1.8.4, CSD as541be (2020)  
Xtriage (Phenix) : 1.13  
EDS : 2.36  
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) : 2.36

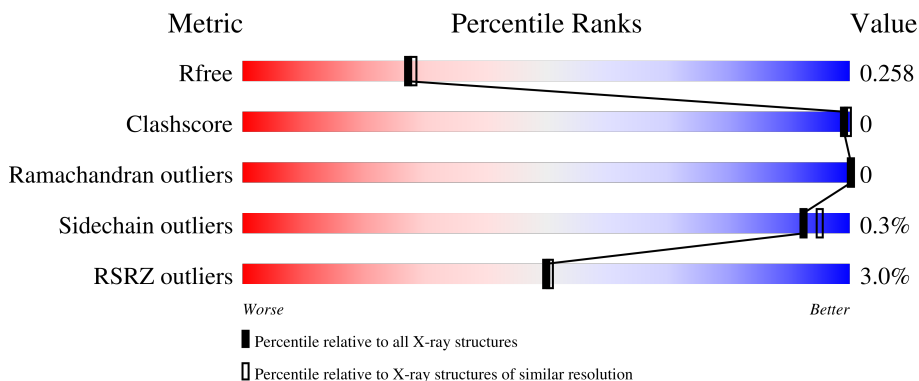
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

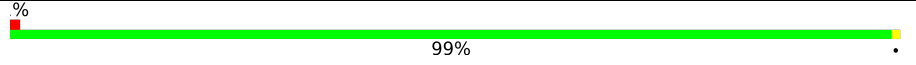
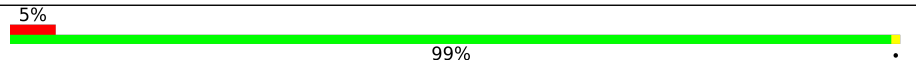
The reported resolution of this entry is 2.23 Å.

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	2391 (2.26-2.22)
Clashscore	141614	2539 (2.26-2.22)
Ramachandran outliers	138981	2489 (2.26-2.22)
Sidechain outliers	138945	2490 (2.26-2.22)
RSRZ outliers	127900	2353 (2.26-2.22)

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	AAA	459	 99%
1	BBB	459	 98%
1	CCC	459	 99%
1	DDD	459	 99%

## 2 Entry composition [i](#)

There are 7 unique types of molecules in this entry. The entry contains 29322 atoms, of which 14785 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 Cyclic 2,3-diphosphoglycerate synthetase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace	
			Total	C	H	N	O				S
1	AAA	459	Total	C	H	N	O	S	70	0	0
			7222	2276	3664	596	667	19			
1	BBB	459	Total	C	H	N	O	S	71	0	0
			7222	2276	3664	596	667	19			
1	CCC	459	Total	C	H	N	O	S	71	0	0
			7222	2276	3664	596	667	19			
1	DDD	459	Total	C	H	N	O	S	71	0	0
			7222	2276	3664	596	667	19			

- Molecule 2 is ADENOSINE-5'-DIPHOSPHATE (three-letter code: ADP) (formula:  $C_{10}H_{15}N_5O_{10}P_2$ ) (labeled as "Ligand of Interest" by depositor).



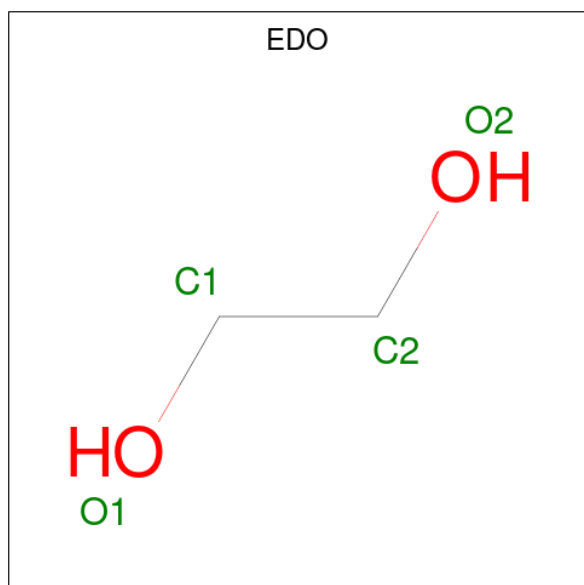
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	
			Total	C	H	N	O			P
2	AAA	1	Total	C	H	N	O	P	2	0
			39	10	12	5	10	2		
2	BBB	1	Total	C	H	N	O	P	2	0
			39	10	12	5	10	2		

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Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	
2	CCC	1	Total	C	H	N	O	P	2	0
			39	10	12	5	10	2		
2	DDD	1	Total	C	H	N	O	P	2	0
			39	10	12	5	10	2		

- Molecule 3 is 1,2-ETHANEDIOL (three-letter code: EDO) (formula: C<sub>2</sub>H<sub>6</sub>O<sub>2</sub>).



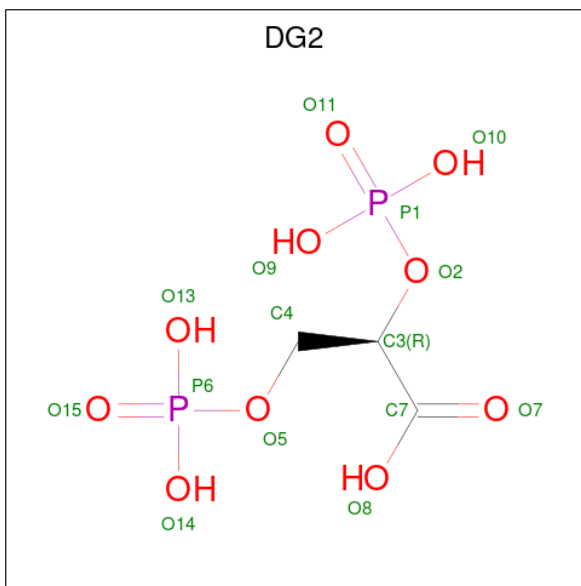
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf	
3	AAA	1	Total	C	H	O	1	0
			10	2	6	2		
3	AAA	1	Total	C	H	O	1	0
			10	2	6	2		
3	BBB	1	Total	C	H	O	1	0
			10	2	6	2		
3	BBB	1	Total	C	H	O	1	0
			10	2	6	2		
3	BBB	1	Total	C	H	O	1	0
			10	2	6	2		
3	BBB	1	Total	C	H	O	1	0
			10	2	6	2		
3	CCC	1	Total	C	H	O	1	0
			10	2	6	2		
3	CCC	1	Total	C	H	O	1	0
			10	2	6	2		
3	CCC	1	Total	C	H	O	1	0
			10	2	6	2		

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Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
3	DDD	1	Total	C	H	O	1	0
			10	2	6	2		
3	DDD	1	Total	C	H	O	1	0
			10	2	6	2		

- Molecule 4 is (2R)-2,3-diphosphoglyceric acid (three-letter code: DG2) (formula:  $C_3H_8O_{10}P_2$ ) (labeled as "Ligand of Interest" by depositor).

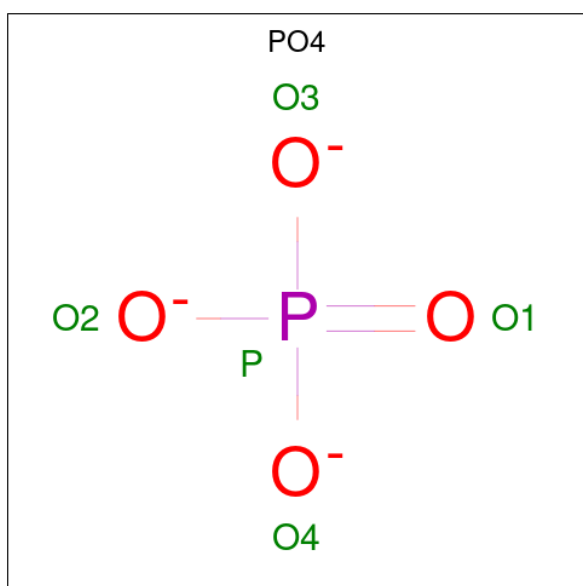


Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
4	AAA	1	Total	C	H	O	P	0	0
			18	3	3	10	2		
4	AAA	1	Total	C	H	O	P	0	0
			18	3	3	10	2		
4	BBB	1	Total	C	H	O	P	0	0
			18	3	3	10	2		
4	CCC	1	Total	C	H	O	P	0	0
			18	3	3	10	2		
4	DDD	1	Total	C	H	O	P	0	0
			18	3	3	10	2		
4	DDD	1	Total	C	O	P		0	0
			15	3	10	2			

- Molecule 5 is MAGNESIUM ION (three-letter code: MG) (formula: Mg) (labeled as "Ligand of Interest" by depositor).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	AAA	2	Total Mg 2 2	0	0
5	BBB	2	Total Mg 2 2	0	0
5	CCC	2	Total Mg 2 2	0	0
5	DDD	2	Total Mg 2 2	0	0

- Molecule 6 is PHOSPHATE ION (three-letter code: PO4) (formula: O<sub>4</sub>P).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	BBB	1	Total O P 5 4 1	0	0

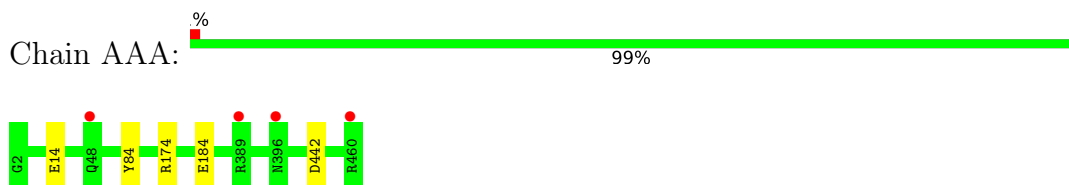
- Molecule 7 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
7	AAA	20	Total O 20 20	0	0
7	BBB	13	Total O 13 13	0	0
7	CCC	12	Total O 12 12	0	0
7	DDD	5	Total O 5 5	0	0

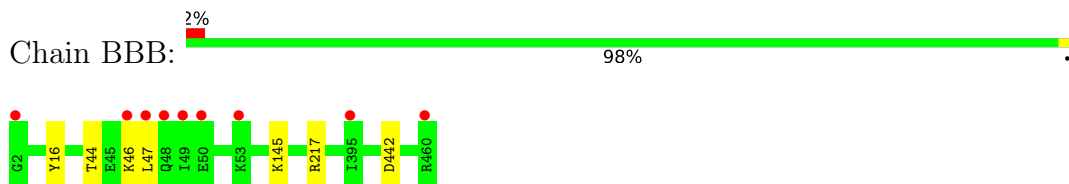
### 3 Residue-property plots [i](#)

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.

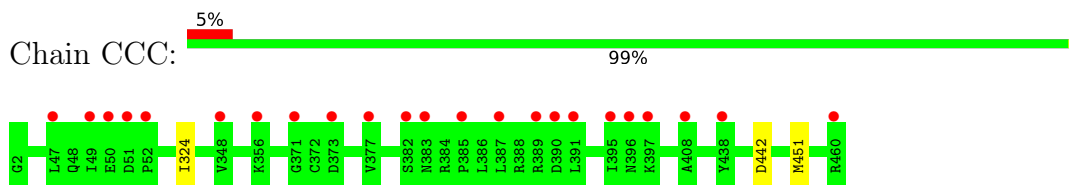
- Molecule 1: Cyclic 2,3-diphosphoglycerate synthetase



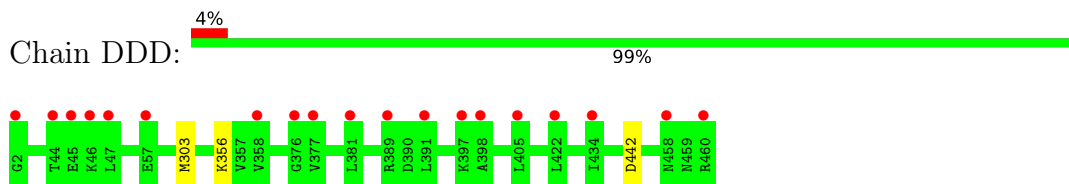
- Molecule 1: Cyclic 2,3-diphosphoglycerate synthetase



- Molecule 1: Cyclic 2,3-diphosphoglycerate synthetase



- Molecule 1: Cyclic 2,3-diphosphoglycerate synthetase



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	71.23Å 71.48Å 103.54Å 97.02° 103.42° 99.05°	Depositor
Resolution (Å)	69.92 – 2.23 69.62 – 2.23	Depositor EDS
% Data completeness (in resolution range)	85.3 (69.92-2.23) 85.3 (69.62-2.23)	Depositor EDS
$R_{merge}$	0.08	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.04 (at 2.22Å)	Xtrriage
Refinement program	REFMAC 5.8.0267	Depositor
R, $R_{free}$	0.216 , 0.256 0.221 , 0.258	Depositor DCC
$R_{free}$ test set	4008 reflections (4.98%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	58.1	Xtrriage
Anisotropy	0.099	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.39 , 43.2	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.50$ , $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.96	EDS
Total number of atoms	29322	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	74.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.03% 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: PO4, EDO, ADP, DG2, 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	AAA	0.67	0/3622	0.79	1/4900 (0.0%)
1	BBB	0.66	0/3622	0.78	0/4900
1	CCC	0.66	0/3622	0.78	0/4900
1	DDD	0.65	0/3622	0.77	0/4900
All	All	0.66	0/14488	0.78	1/19600 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	AAA	174	ARG	NE-CZ-NH1	-6.28	117.16	120.30

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	AAA	3558	3664	3653	2	2
1	BBB	3558	3664	3653	3	2
1	CCC	3558	3664	3653	2	0
1	DDD	3558	3664	3653	4	0
2	AAA	27	12	12	0	0
2	BBB	27	12	12	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	CCC	27	12	12	0	0
2	DDD	27	12	12	1	0
3	AAA	8	12	12	0	0
3	BBB	16	24	24	0	0
3	CCC	12	18	18	1	0
3	DDD	8	12	12	0	0
4	AAA	30	6	8	0	0
4	BBB	15	3	4	0	0
4	CCC	15	3	4	0	0
4	DDD	30	3	8	3	0
5	AAA	2	0	0	0	0
5	BBB	2	0	0	0	0
5	CCC	2	0	0	0	0
5	DDD	2	0	0	0	0
6	BBB	5	0	0	0	0
7	AAA	20	0	0	0	0
7	BBB	13	0	0	0	0
7	CCC	12	0	0	0	0
7	DDD	5	0	0	0	0
All	All	14537	14785	14750	9	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 0.

All (9) 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:DDD:356:LYS:NZ	4:DDD:504:DG2:H3	2.15	0.62
1:AAA:14:GLU:OE1	1:BBB:145:LYS:NZ	2.44	0.48
1:AAA:84:TYR:CE2	1:CCC:451:MET:CE	2.98	0.47
1:CCC:324:ILE:HG22	3:CCC:505:EDO:H11	1.98	0.46
1:BBB:16:TYR:CD2	1:BBB:46:LYS:HE3	2.51	0.46
1:DDD:356:LYS:HZ1	4:DDD:504:DG2:H3	1.81	0.45
1:DDD:356:LYS:HZ2	4:DDD:504:DG2:H3	1.83	0.43
1:BBB:44:THR:HB	1:BBB:47:LEU:HD11	2.00	0.42
1:DDD:303:MET:SD	2:DDD:501:ADP:C2	3.14	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:AAA:184:GLU:OE1	1:BBB:217:ARG:NH1[1_445]	2.00	0.20
1:AAA:184:GLU:OE1	1:BBB:217:ARG:HH12[1_445]	1.50	0.10

### 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	AAA	457/459 (100%)	446 (98%)	11 (2%)	0	100	100
1	BBB	457/459 (100%)	448 (98%)	9 (2%)	0	100	100
1	CCC	457/459 (100%)	447 (98%)	10 (2%)	0	100	100
1	DDD	457/459 (100%)	447 (98%)	10 (2%)	0	100	100
All	All	1828/1836 (100%)	1788 (98%)	40 (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	AAA	391/391 (100%)	390 (100%)	1 (0%)	92	95
1	BBB	391/391 (100%)	390 (100%)	1 (0%)	92	95
1	CCC	391/391 (100%)	390 (100%)	1 (0%)	92	95
1	DDD	391/391 (100%)	390 (100%)	1 (0%)	92	95
All	All	1564/1564 (100%)	1560 (100%)	4 (0%)	92	95

All (4) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	AAA	442	ASP
1	BBB	442	ASP
1	CCC	442	ASP
1	DDD	442	ASP

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

### 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 30 ligands modelled in this entry, 8 are monoatomic - leaving 22 for Mogul analysis.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. 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  $|Z| > 2$  is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z  > 2$	Counts	RMSZ	$\# Z  > 2$
4	DG2	AAA	503	-	13,14,14	0.89	0	18,21,21	1.08	2 (11%)
4	DG2	DDD	503	5	13,14,14	1.40	2 (15%)	18,21,21	0.83	0
3	EDO	BBB	606	-	3,3,3	0.15	0	2,2,2	0.10	0
3	EDO	BBB	601	-	3,3,3	0.27	0	2,2,2	0.71	0
3	EDO	AAA	502	-	3,3,3	0.25	0	2,2,2	0.45	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
4	DG2	DDD	504	-	13,14,14	0.89	0	18,21,21	1.13	2 (11%)
3	EDO	CCC	505	-	3,3,3	0.25	0	2,2,2	0.31	0
3	EDO	BBB	604	-	3,3,3	0.06	0	2,2,2	0.16	0
4	DG2	BBB	602	-	13,14,14	0.98	0	18,21,21	1.02	1 (5%)
3	EDO	CCC	504	-	3,3,3	0.13	0	2,2,2	0.23	0
3	EDO	DDD	505	-	3,3,3	0.14	0	2,2,2	0.09	0
2	ADP	DDD	501	5	24,29,29	0.69	0	29,45,45	1.00	3 (10%)
4	DG2	CCC	503	5	13,14,14	1.03	1 (7%)	18,21,21	0.94	1 (5%)
6	PO4	BBB	609	5	4,4,4	0.58	0	6,6,6	0.67	0
4	DG2	AAA	504	5	13,14,14	1.17	1 (7%)	18,21,21	1.03	1 (5%)
3	EDO	CCC	502	-	3,3,3	0.15	0	2,2,2	0.50	0
2	ADP	AAA	501	5	24,29,29	0.69	0	29,45,45	0.93	2 (6%)
3	EDO	DDD	502	-	3,3,3	0.21	0	2,2,2	0.38	0
2	ADP	BBB	603	5	24,29,29	0.70	0	29,45,45	0.96	2 (6%)
3	EDO	AAA	505	-	3,3,3	0.04	0	2,2,2	0.05	0
2	ADP	CCC	501	5	24,29,29	0.65	0	29,45,45	0.92	2 (6%)
3	EDO	BBB	605	-	3,3,3	0.13	0	2,2,2	0.28	0

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
4	DG2	AAA	503	-	-	4/15/15/15	-
4	DG2	DDD	503	5	-	7/15/15/15	-
3	EDO	BBB	606	-	-	0/1/1/1	-
3	EDO	BBB	601	-	-	0/1/1/1	-
3	EDO	AAA	502	-	-	0/1/1/1	-
4	DG2	DDD	504	-	-	8/15/15/15	-
3	EDO	CCC	505	-	-	0/1/1/1	-
3	EDO	BBB	604	-	-	0/1/1/1	-
4	DG2	BBB	602	-	-	7/15/15/15	-
3	EDO	CCC	504	-	-	0/1/1/1	-
3	EDO	DDD	505	-	-	0/1/1/1	-
2	ADP	DDD	501	5	-	2/12/32/32	0/3/3/3
4	DG2	CCC	503	5	-	4/15/15/15	-
4	DG2	AAA	504	5	-	2/15/15/15	-
3	EDO	CCC	502	-	-	1/1/1/1	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	ADP	AAA	501	5	-	3/12/32/32	0/3/3/3
3	EDO	DDD	502	-	-	0/1/1/1	-
2	ADP	BBB	603	5	-	3/12/32/32	0/3/3/3
3	EDO	AAA	505	-	-	0/1/1/1	-
2	ADP	CCC	501	5	-	2/12/32/32	0/3/3/3
3	EDO	BBB	605	-	-	0/1/1/1	-

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	DDD	503	DG2	P1-O2	3.23	1.65	1.59
4	AAA	504	DG2	P1-O2	2.84	1.64	1.59
4	DDD	503	DG2	C3-C7	2.63	1.54	1.52
4	CCC	503	DG2	P1-O2	2.03	1.63	1.59

All (16) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	DDD	501	ADP	PA-O3A-PB	-2.65	123.72	132.83
4	DDD	504	DG2	O2-C3-C4	2.65	110.91	106.56
4	AAA	504	DG2	O7-C7-C3	-2.49	116.68	122.57
2	DDD	501	ADP	O4'-C1'-C2'	-2.48	103.30	106.93
4	AAA	503	DG2	O7-C7-C3	-2.48	116.72	122.57
2	CCC	501	ADP	O4'-C1'-C2'	-2.45	103.34	106.93
2	BBB	603	ADP	O4'-C1'-C2'	-2.38	103.44	106.93
2	DDD	501	ADP	C5-C6-N6	2.35	123.92	120.35
2	AAA	501	ADP	O4'-C1'-C2'	-2.31	103.55	106.93
4	DDD	504	DG2	O7-C7-C3	-2.31	117.12	122.57
2	BBB	603	ADP	C5-C6-N6	2.29	123.84	120.35
2	CCC	501	ADP	C5-C6-N6	2.24	123.76	120.35
4	BBB	602	DG2	O7-C7-C3	-2.21	117.36	122.57
4	CCC	503	DG2	O7-C7-C3	-2.18	117.42	122.57
4	AAA	503	DG2	O2-C3-C4	2.08	109.98	106.56
2	AAA	501	ADP	C5-C6-N6	2.06	123.49	120.35

There are no chirality outliers.

All (43) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	AAA	503	DG2	O2-C3-C7-O7

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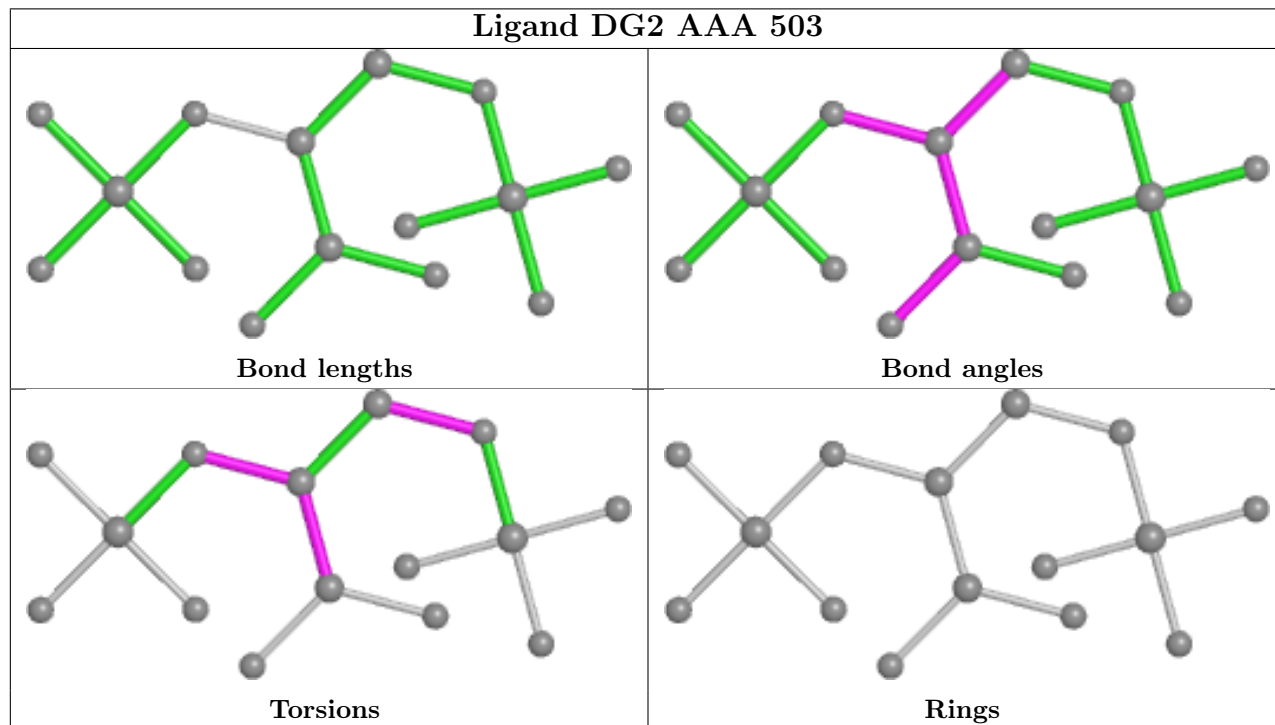
Mol	Chain	Res	Type	Atoms
4	AAA	503	DG2	O2-C3-C7-O8
4	AAA	504	DG2	C3-O2-P1-O9
4	BBB	602	DG2	C7-C3-C4-O5
4	BBB	602	DG2	O2-C3-C7-O7
4	CCC	503	DG2	O2-C3-C7-O8
4	CCC	503	DG2	C3-C4-O5-P6
4	DDD	503	DG2	O2-C3-C4-O5
4	DDD	503	DG2	C7-C3-C4-O5
4	DDD	503	DG2	O2-C3-C7-O7
4	DDD	503	DG2	O2-C3-C7-O8
4	DDD	504	DG2	O2-C3-C4-O5
4	DDD	504	DG2	C7-C3-C4-O5
4	DDD	504	DG2	O2-C3-C7-O7
4	AAA	503	DG2	C4-C3-O2-P1
4	BBB	602	DG2	O2-C3-C7-O8
4	AAA	503	DG2	C3-C4-O5-P6
4	DDD	503	DG2	C3-C4-O5-P6
4	DDD	504	DG2	C3-C4-O5-P6
4	DDD	504	DG2	O2-C3-C7-O8
4	CCC	503	DG2	C3-O2-P1-O9
4	CCC	503	DG2	C3-O2-P1-O10
2	BBB	603	ADP	PB-O3A-PA-O1A
2	DDD	501	ADP	PB-O3A-PA-O2A
4	BBB	602	DG2	O2-C3-C4-O5
4	BBB	602	DG2	C4-C3-C7-O7
4	BBB	602	DG2	C4-C3-C7-O8
4	BBB	602	DG2	C4-C3-O2-P1
4	DDD	503	DG2	C4-C3-O2-P1
2	AAA	501	ADP	PB-O3A-PA-O1A
2	AAA	501	ADP	PB-O3A-PA-O2A
2	BBB	603	ADP	O4'-C4'-C5'-O5'
4	AAA	504	DG2	C4-C3-O2-P1
4	DDD	504	DG2	C4-C3-C7-O7
4	DDD	504	DG2	C4-C3-C7-O8
4	DDD	504	DG2	C4-O5-P6-O13
2	CCC	501	ADP	O4'-C4'-C5'-O5'
4	DDD	503	DG2	C3-O2-P1-O9
2	AAA	501	ADP	O4'-C4'-C5'-O5'
2	DDD	501	ADP	O4'-C4'-C5'-O5'
2	BBB	603	ADP	PB-O3A-PA-O2A
2	CCC	501	ADP	PB-O3A-PA-O1A
3	CCC	502	EDO	O1-C1-C2-O2

There are no ring outliers.

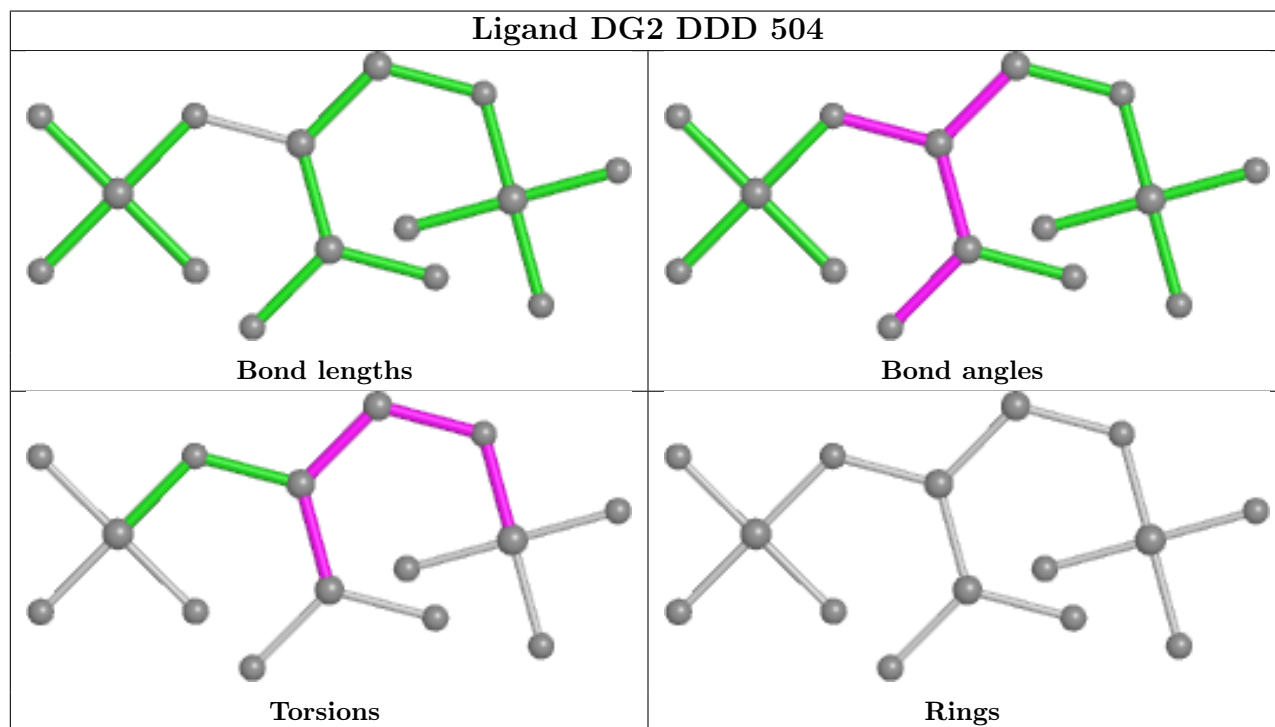
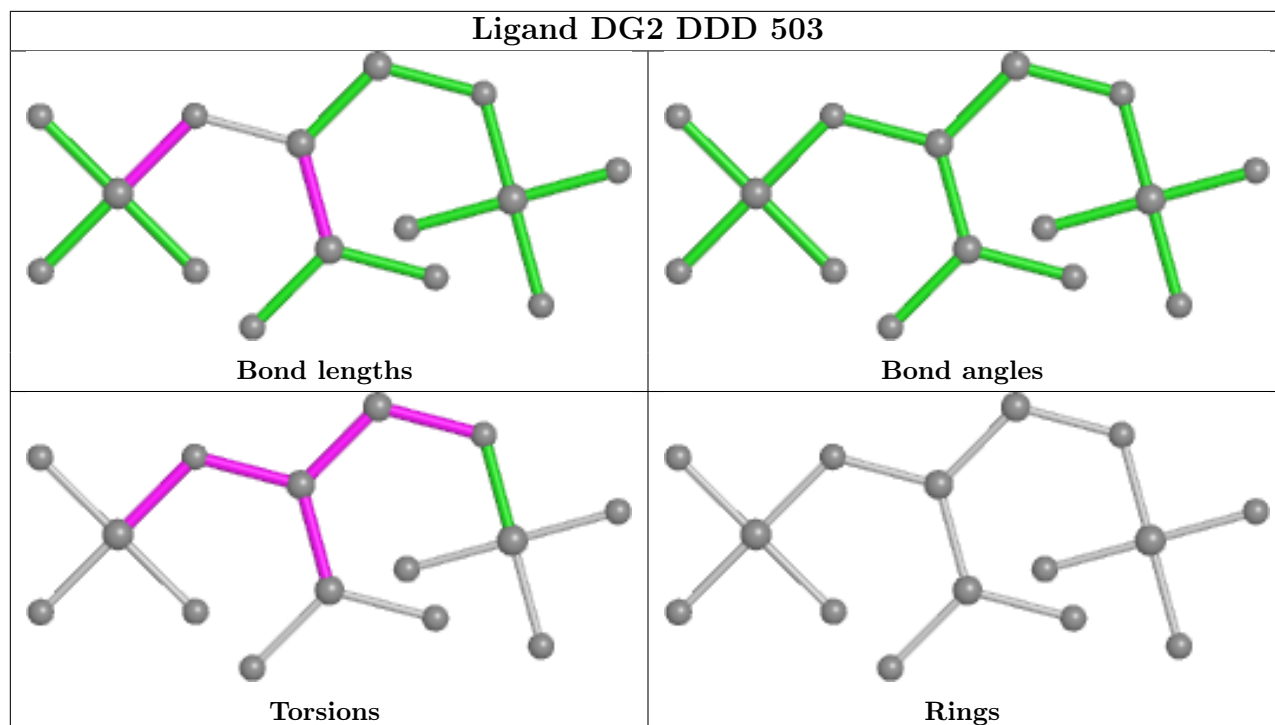
3 monomers are involved in 5 short contacts:

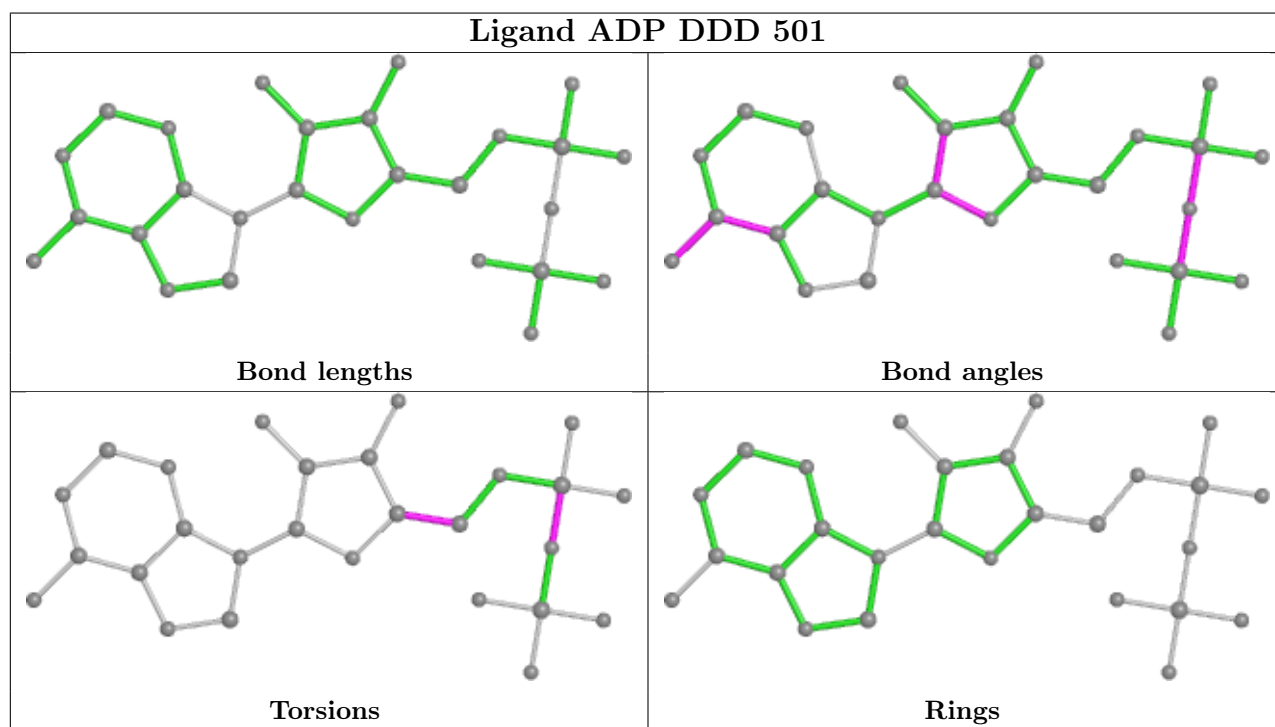
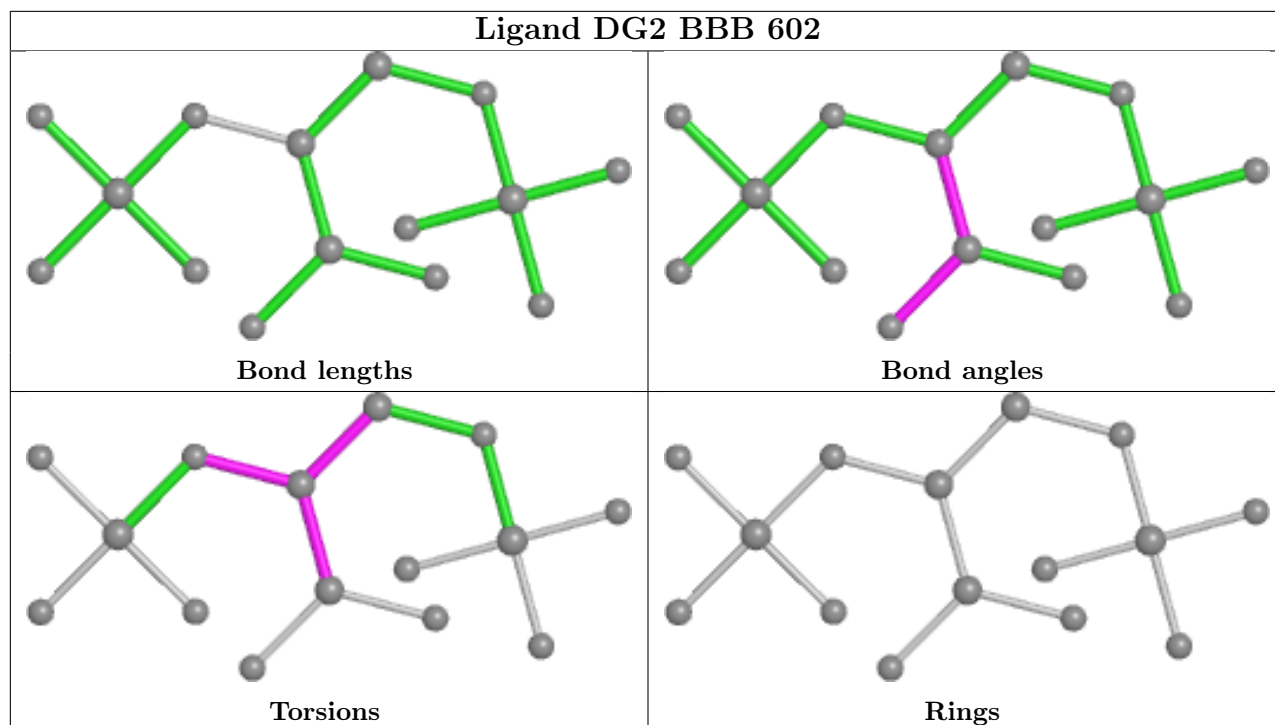
Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	DDD	504	DG2	3	0
3	CCC	505	EDO	1	0
2	DDD	501	ADP	1	0

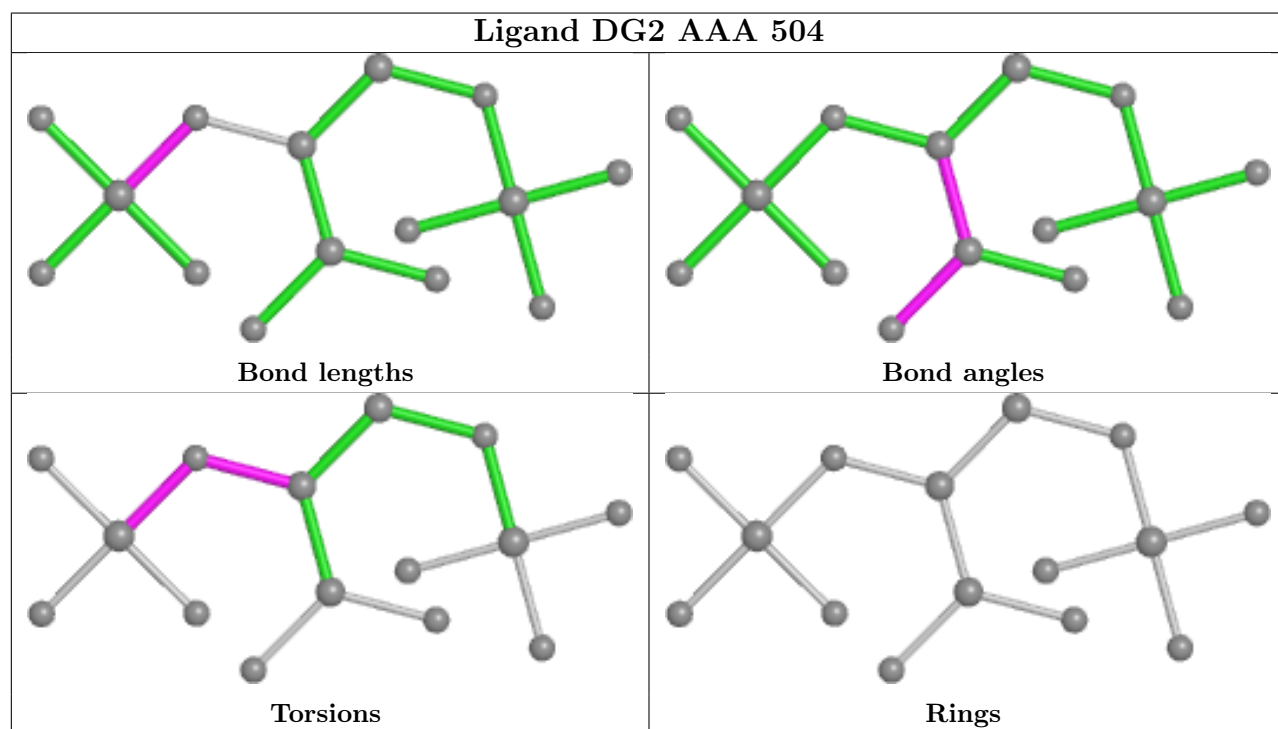
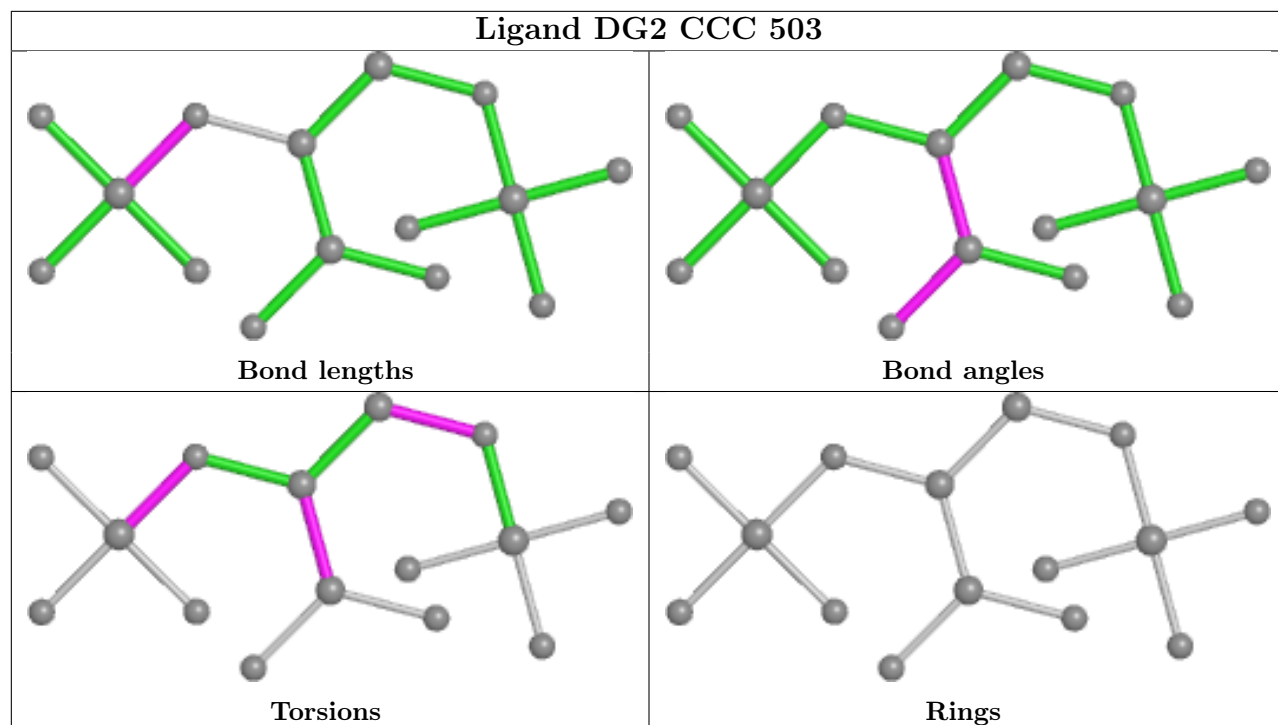
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.

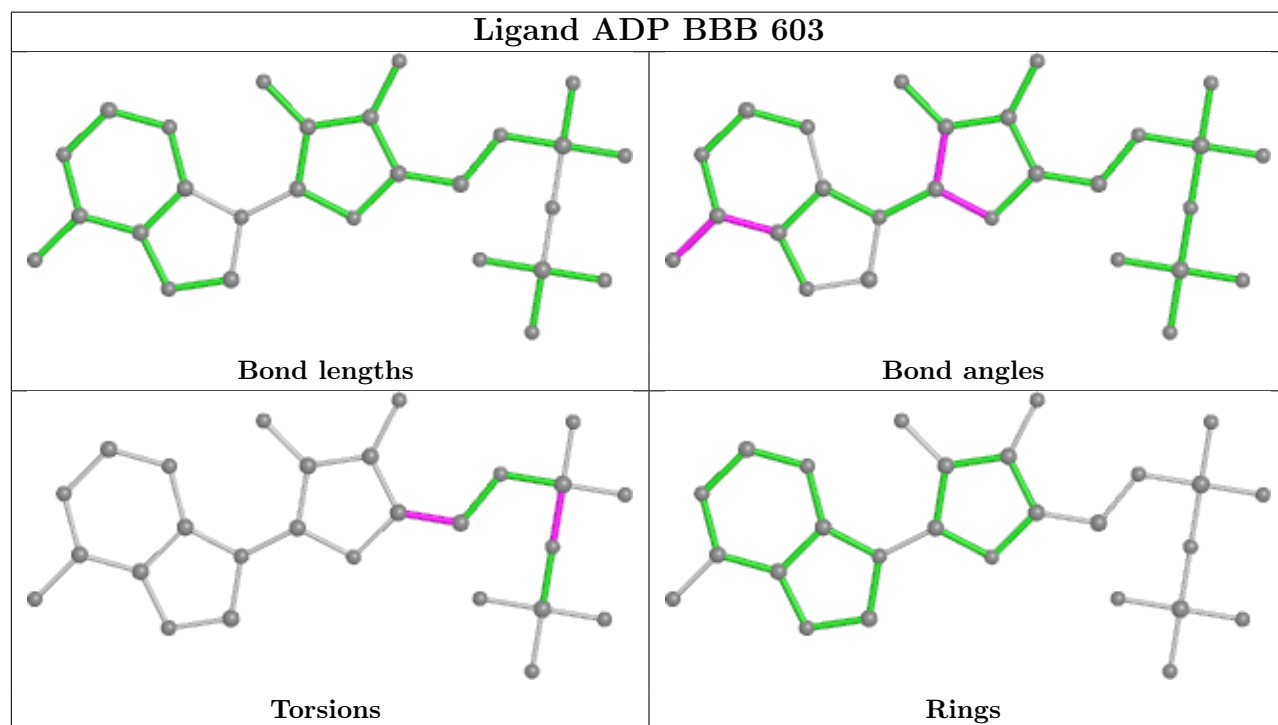
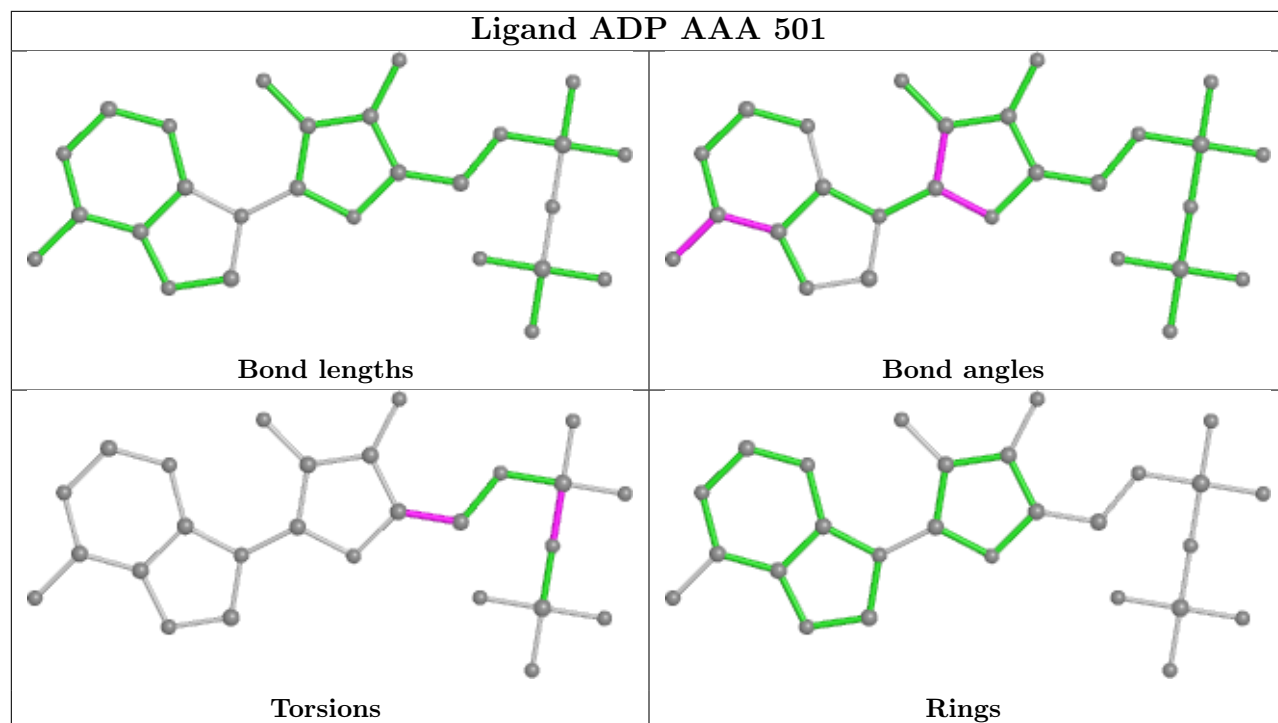


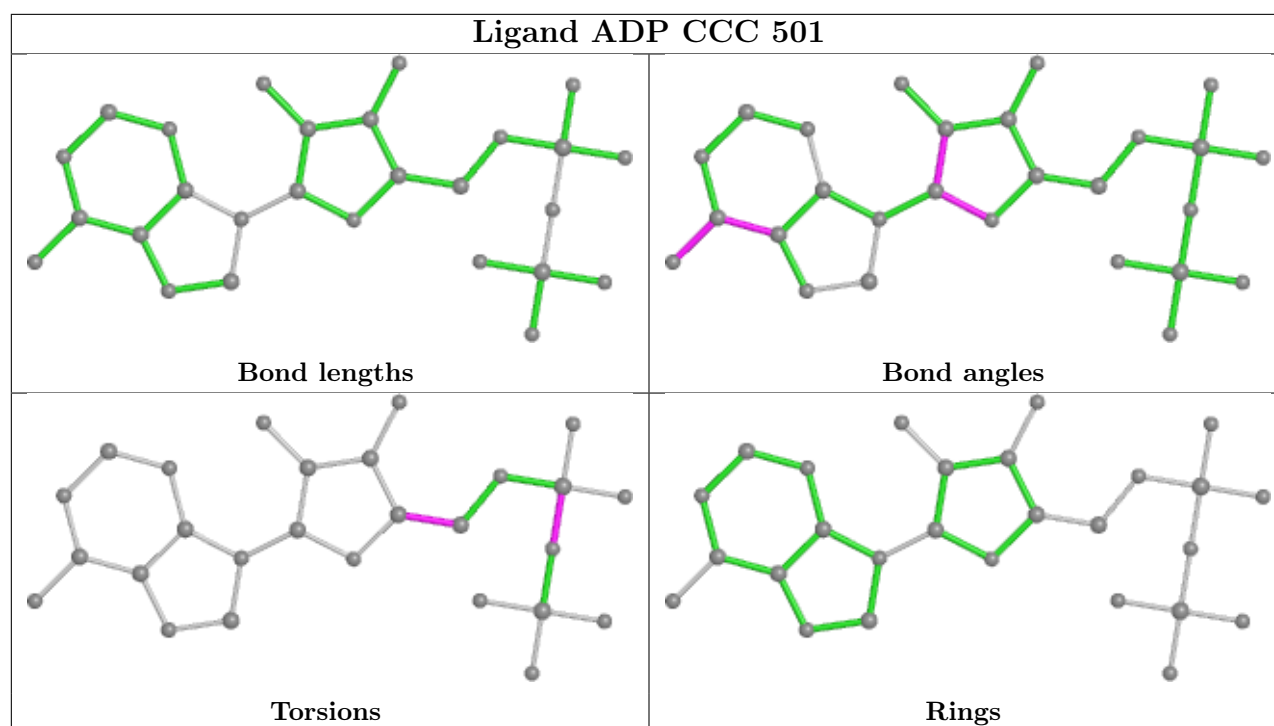












## 5.7 Other polymers [i](#)

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<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	AAA	459/459 (100%)	0.24	4 (0%) 84 84	35, 60, 100, 185	0
1	BBB	459/459 (100%)	0.29	9 (1%) 65 66	35, 66, 110, 175	0
1	CCC	459/459 (100%)	0.42	23 (5%) 28 28	40, 70, 133, 184	0
1	DDD	459/459 (100%)	0.41	19 (4%) 37 37	44, 76, 130, 168	0
All	All	1836/1836 (100%)	0.34	55 (2%) 50 50	35, 68, 123, 185	0

All (55) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	BBB	460	ARG	9.7
1	AAA	460	ARG	9.6
1	DDD	47	LEU	8.1
1	DDD	460	ARG	5.8
1	BBB	47	LEU	5.5
1	BBB	49	ILE	4.9
1	CCC	390	ASP	4.8
1	CCC	387	LEU	4.4
1	DDD	45	GLU	4.4
1	DDD	397	LYS	4.3
1	CCC	460	ARG	4.1
1	CCC	397	LYS	3.9
1	BBB	2	GLY	3.8
1	DDD	377	VAL	3.8
1	CCC	50	GLU	3.8
1	CCC	396	ASN	3.5
1	DDD	46	LYS	3.5
1	CCC	377	VAL	3.3
1	DDD	422	LEU	3.3
1	BBB	48	GLN	3.2
1	BBB	46	LYS	3.2

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Mol	Chain	Res	Type	RSRZ
1	BBB	53	LYS	3.1
1	BBB	50	GLU	3.1
1	CCC	348	VAL	3.0
1	DDD	389	ARG	3.0
1	DDD	434	ILE	2.9
1	CCC	408	ALA	2.8
1	CCC	391	LEU	2.8
1	CCC	49	ILE	2.8
1	DDD	376	GLY	2.7
1	CCC	385	PRO	2.6
1	AAA	396	ASN	2.6
1	CCC	371	GLY	2.6
1	CCC	356	LYS	2.6
1	CCC	47	LEU	2.5
1	CCC	395	ILE	2.5
1	DDD	2	GLY	2.4
1	DDD	358	VAL	2.4
1	BBB	395	ILE	2.4
1	DDD	458	ASN	2.4
1	AAA	389	ARG	2.3
1	DDD	44	THR	2.3
1	CCC	383	ASN	2.3
1	CCC	389	ARG	2.2
1	AAA	48	GLN	2.2
1	CCC	373	ASP	2.2
1	DDD	391	LEU	2.2
1	DDD	57	GLU	2.2
1	DDD	405	LEU	2.1
1	CCC	438	TYR	2.1
1	DDD	381	LEU	2.1
1	CCC	382	SER	2.1
1	CCC	51	ASP	2.1
1	DDD	398	ALA	2.1
1	CCC	52	PRO	2.1

## 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](#)

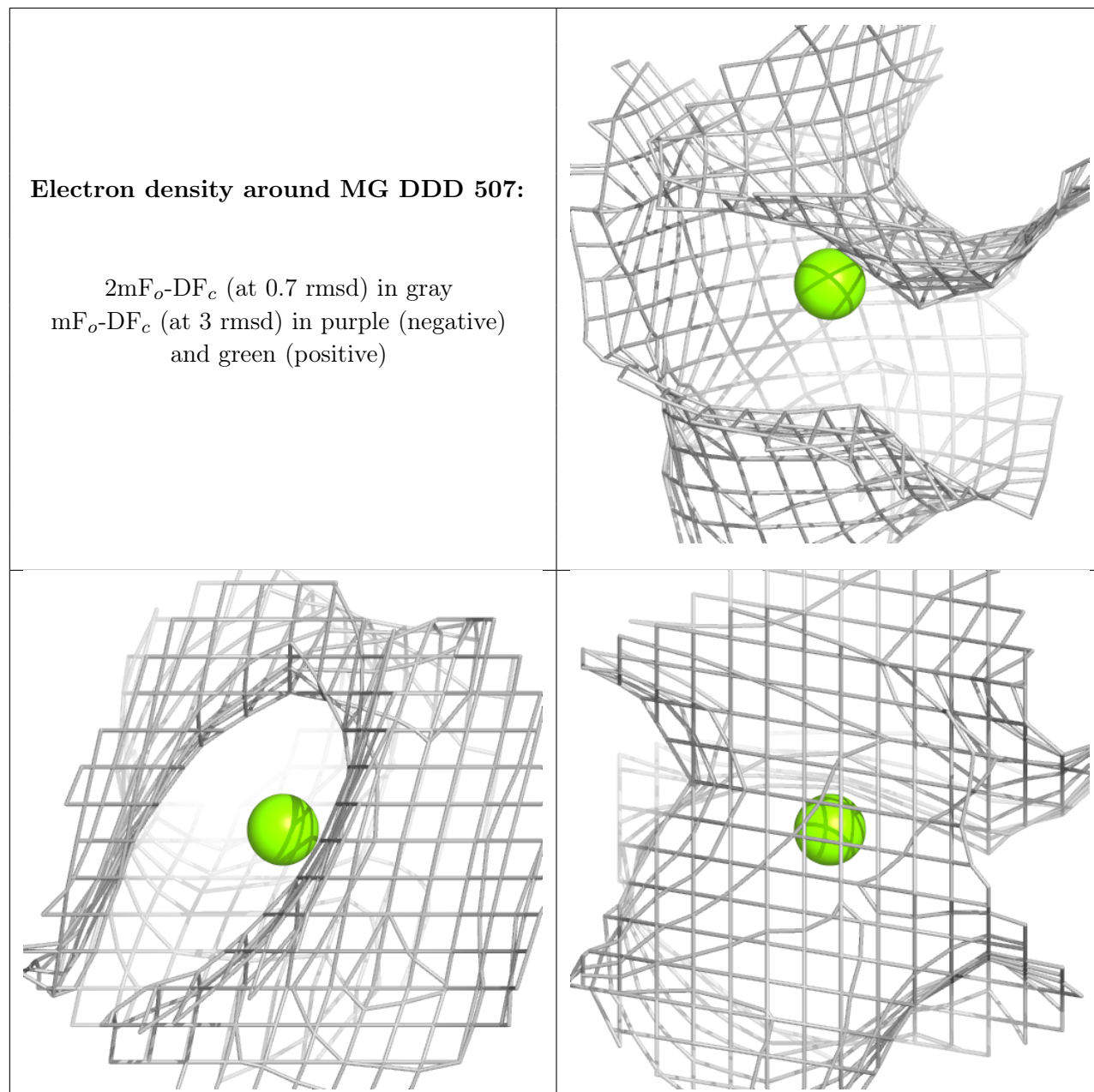
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95<sup>th</sup> percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 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
5	MG	DDD	507	1/1	0.60	0.09	101,101,101,101	0
5	MG	BBB	608	1/1	0.61	0.09	73,73,73,73	0
3	EDO	DDD	502	4/4	0.73	0.19	69,80,80,81	1
4	DG2	DDD	504	15/15	0.73	0.15	124,148,186,196	0
3	EDO	BBB	605	4/4	0.77	0.14	57,78,81,86	1
3	EDO	CCC	505	4/4	0.79	0.16	67,76,79,83	1
3	EDO	BBB	601	4/4	0.80	0.17	53,70,71,78	1
3	EDO	CCC	502	4/4	0.81	0.16	67,77,80,85	1
4	DG2	AAA	503	15/15	0.85	0.10	106,126,162,166	0
3	EDO	CCC	504	4/4	0.87	0.15	66,70,93,98	1
3	EDO	BBB	604	4/4	0.87	0.19	55,59,67,67	1
4	DG2	BBB	602	15/15	0.87	0.13	98,116,146,166	0
5	MG	CCC	506	1/1	0.88	0.09	58,58,58,58	0
3	EDO	AAA	505	4/4	0.90	0.16	53,68,85,92	1
5	MG	DDD	506	1/1	0.91	0.14	55,55,55,55	0
5	MG	BBB	607	1/1	0.91	0.18	51,51,51,51	0
3	EDO	DDD	505	4/4	0.92	0.15	66,68,70,73	1
5	MG	AAA	506	1/1	0.93	0.11	50,50,50,50	0
5	MG	AAA	507	1/1	0.94	0.08	79,79,79,79	0
3	EDO	BBB	606	4/4	0.94	0.12	63,78,88,91	1
4	DG2	AAA	504	15/15	0.96	0.14	48,73,91,93	0
3	EDO	AAA	502	4/4	0.96	0.11	50,54,61,62	1
4	DG2	CCC	503	15/15	0.96	0.15	58,84,112,112	0
4	DG2	DDD	503	15/15	0.96	0.17	59,138,187,196	0
2	ADP	BBB	603	27/27	0.98	0.14	43,56,71,85	2
2	ADP	CCC	501	27/27	0.98	0.13	41,65,83,89	2
6	PO4	BBB	609	5/5	0.98	0.12	57,59,62,71	0
2	ADP	AAA	501	27/27	0.99	0.15	34,54,79,88	2
2	ADP	DDD	501	27/27	0.99	0.14	45,66,78,82	2
5	MG	CCC	507	1/1	0.99	0.10	80,80,80,80	0

The following is a graphical depiction of the model fit to experimental electron density of all

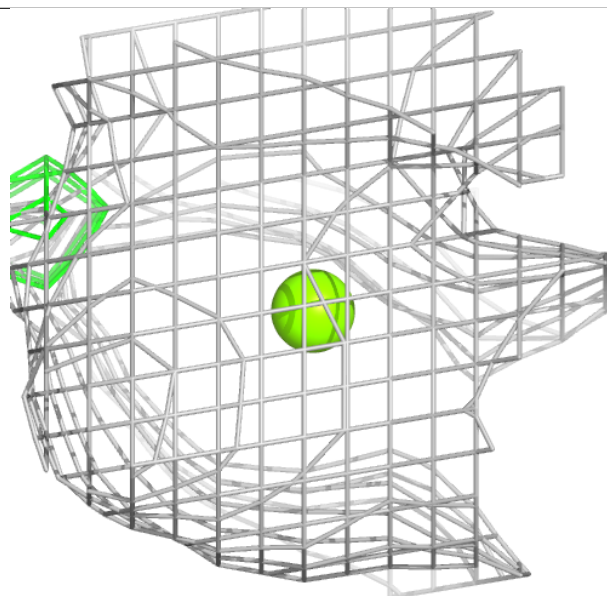
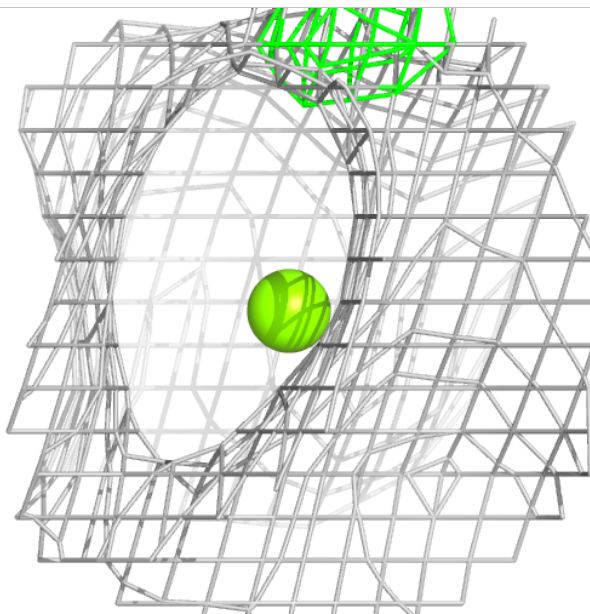
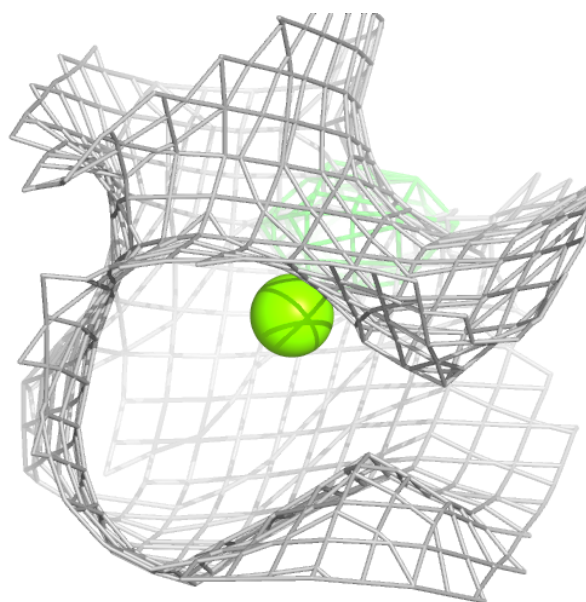


instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.



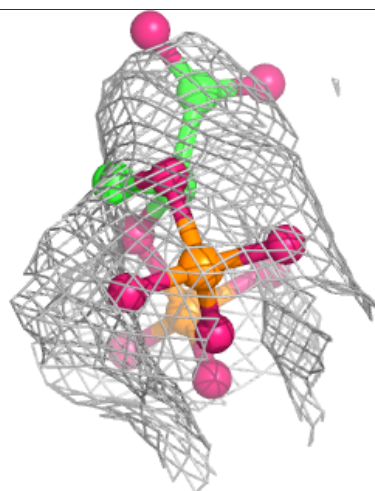
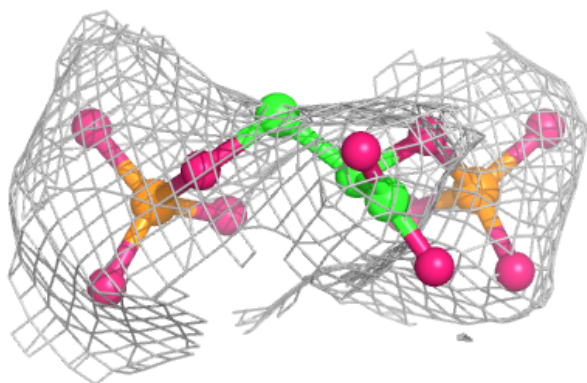
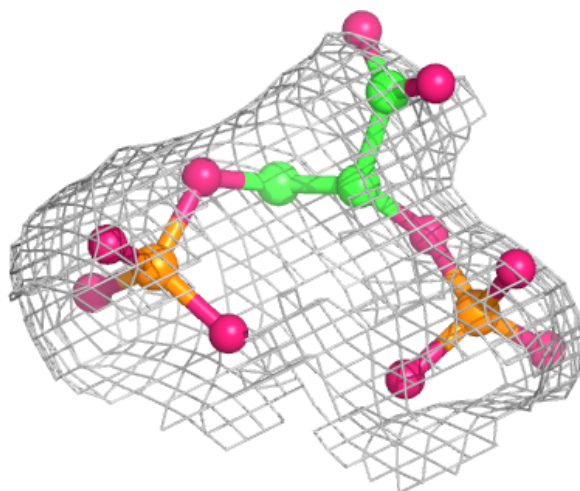
**Electron density around MG BBB 608:**

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



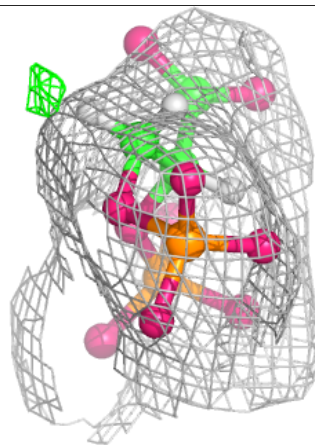
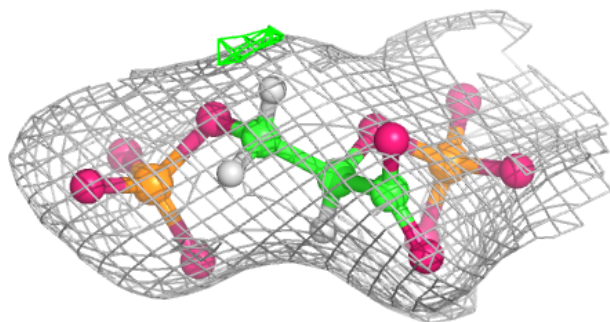
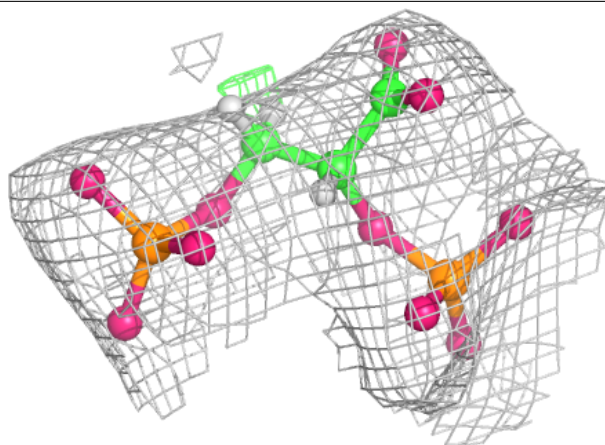
**Electron density around DG2 DDD 504:**

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



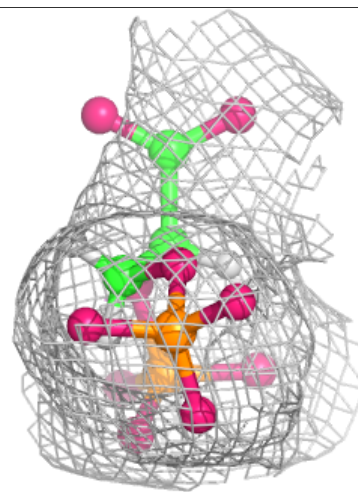
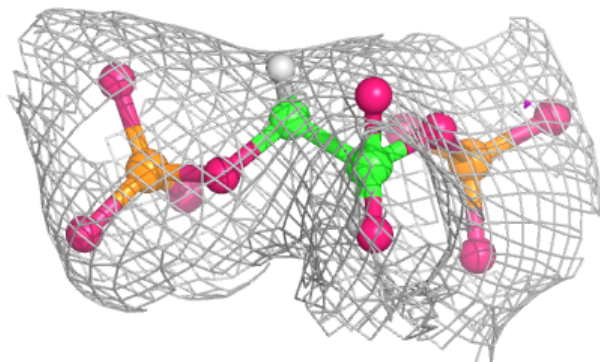
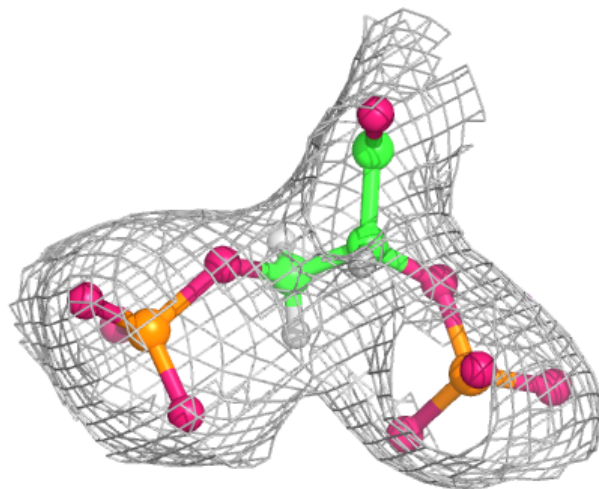
**Electron density around DG2 AAA 503:**

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



**Electron density around DG2 BBB 602:**

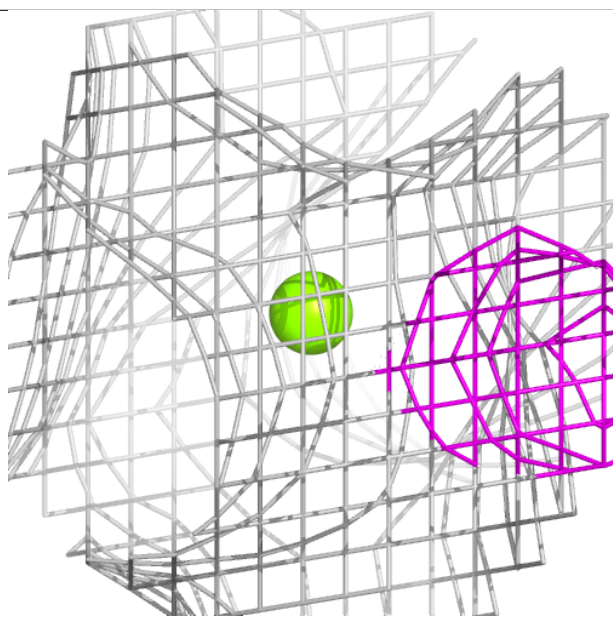
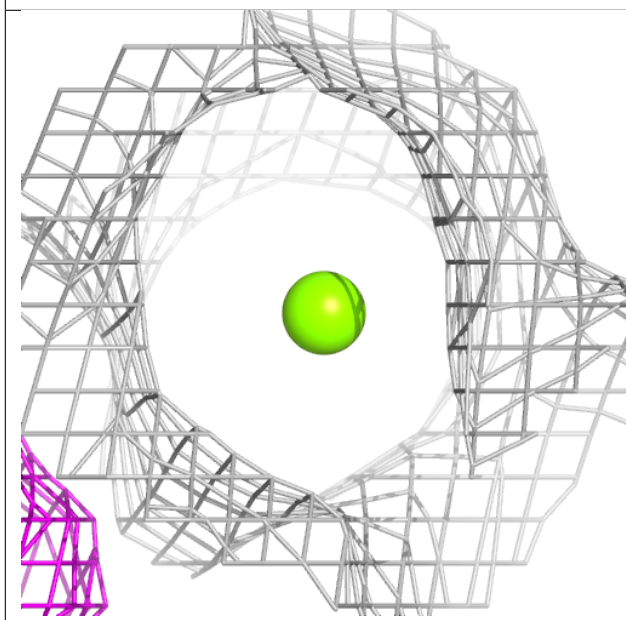
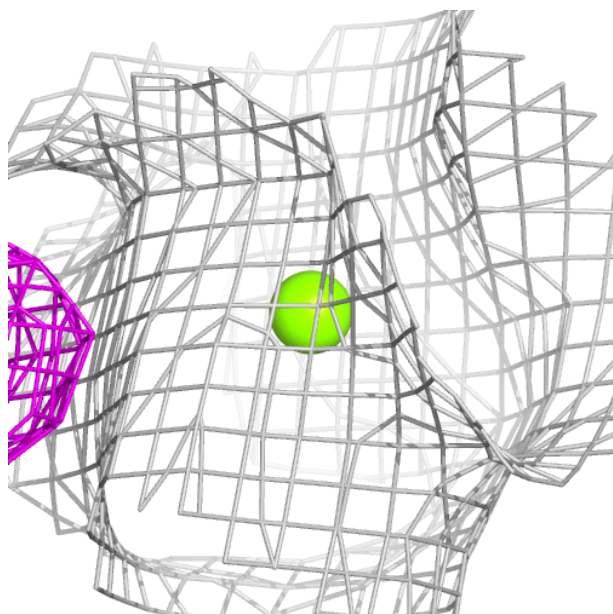
$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)





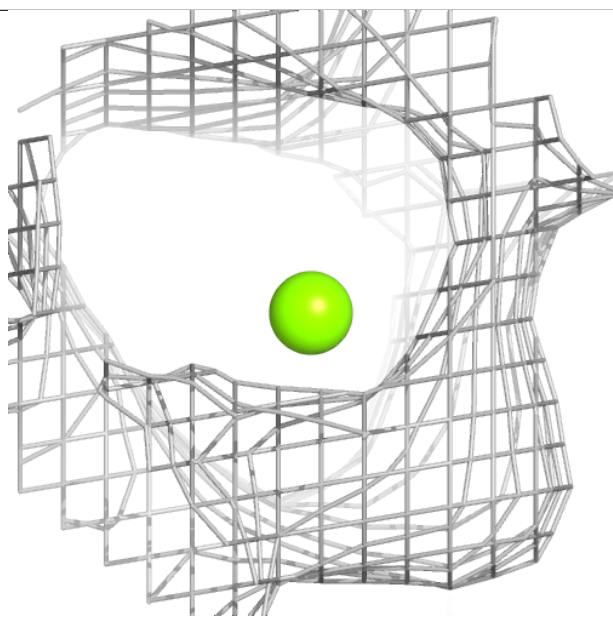
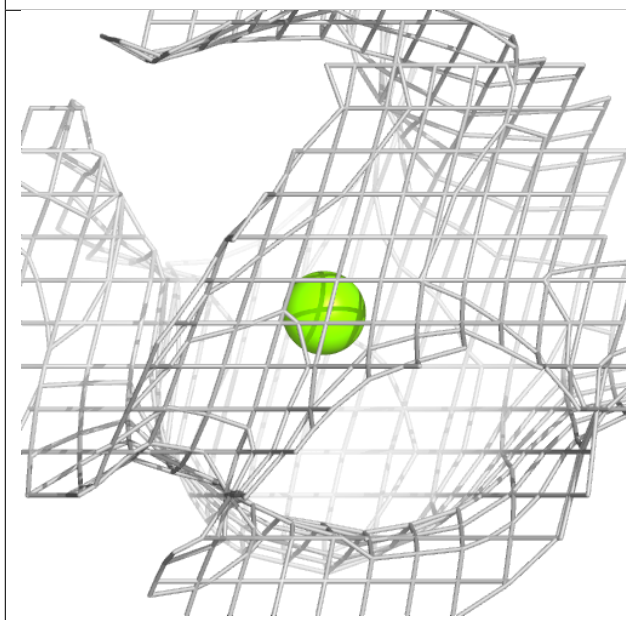
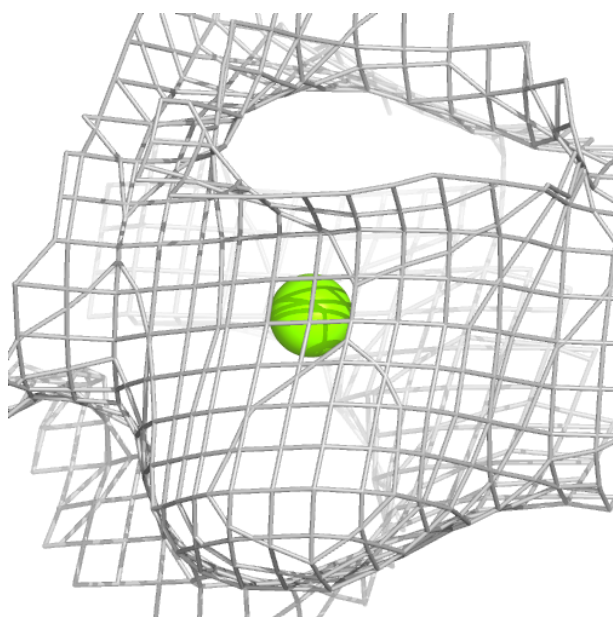
**Electron density around MG CCC 506:**

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



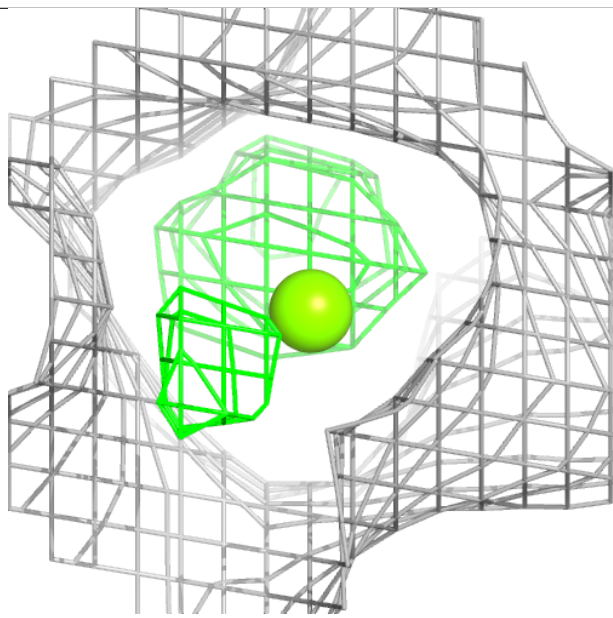
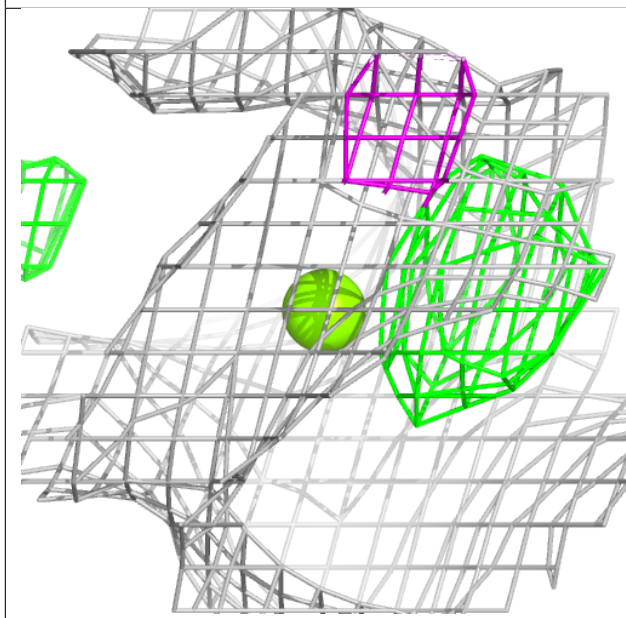
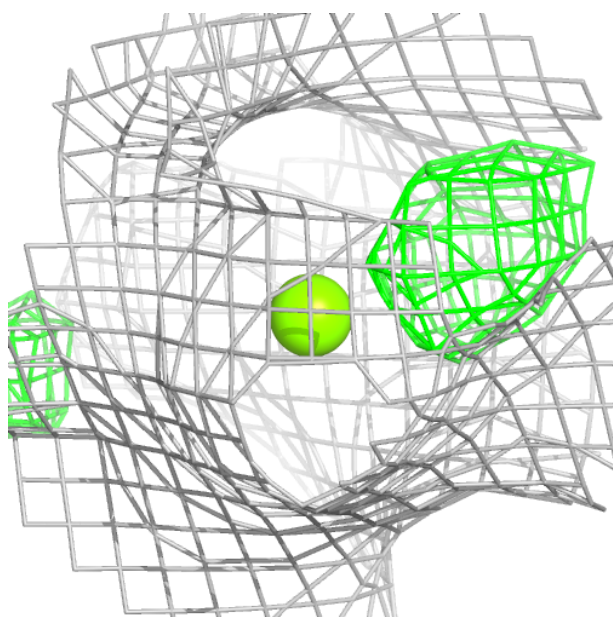
**Electron density around MG DDD 506:**

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



**Electron density around MG BBB 607:**

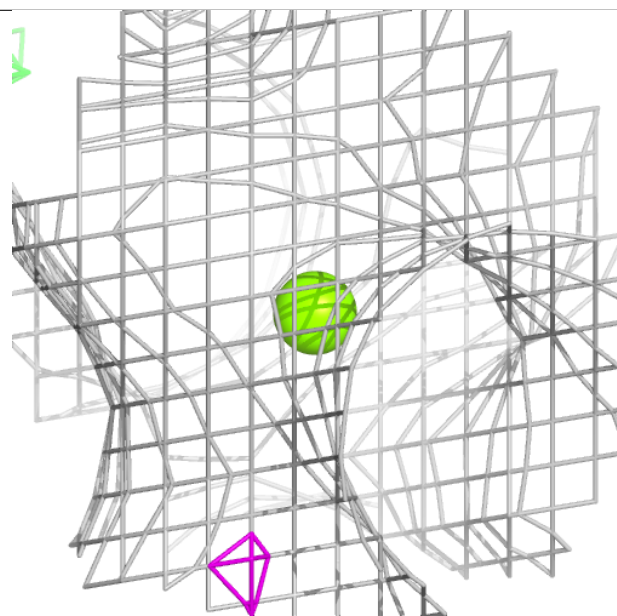
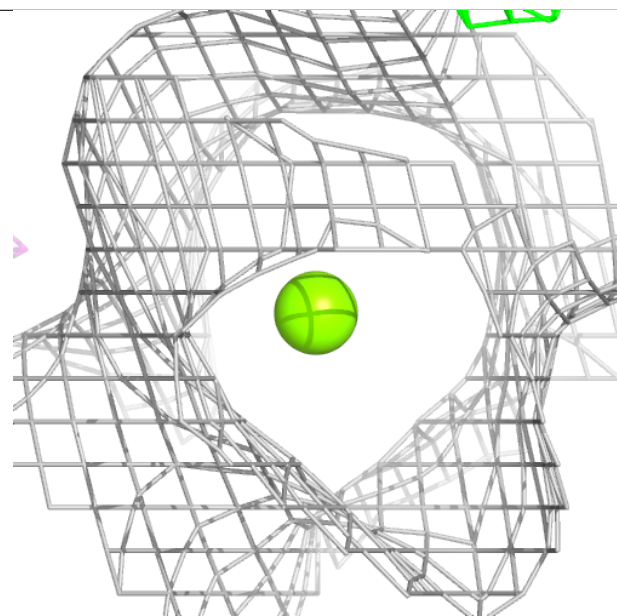
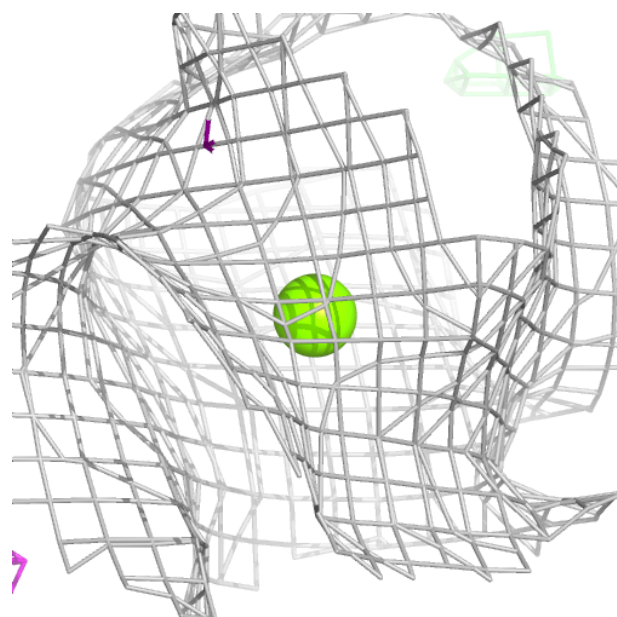
$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)





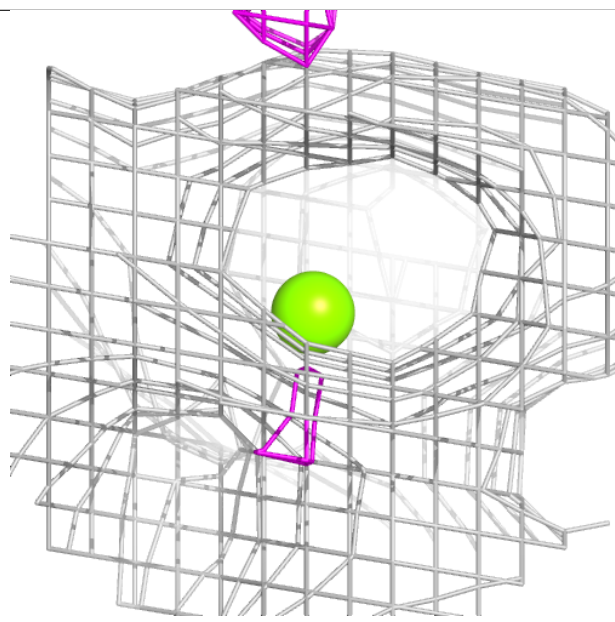
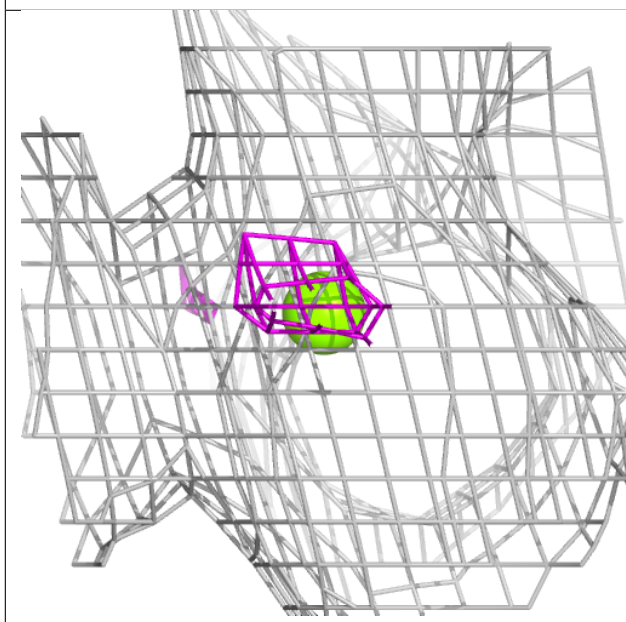
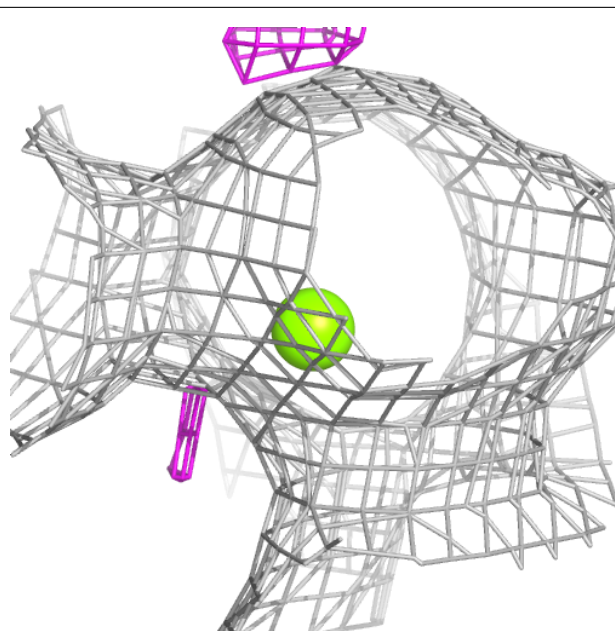
**Electron density around MG AAA 506:**

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



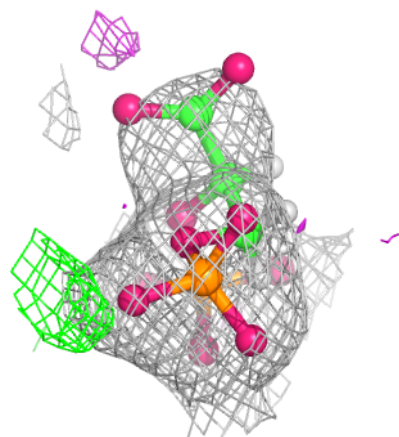
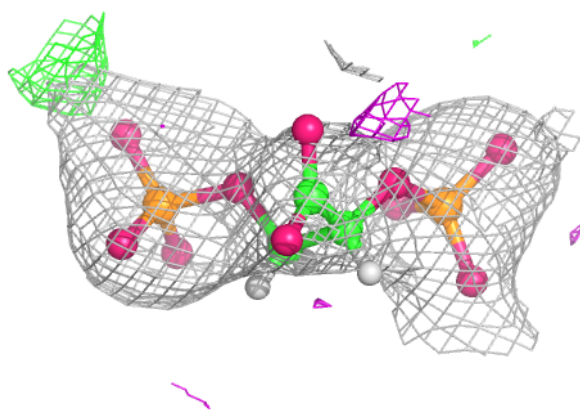
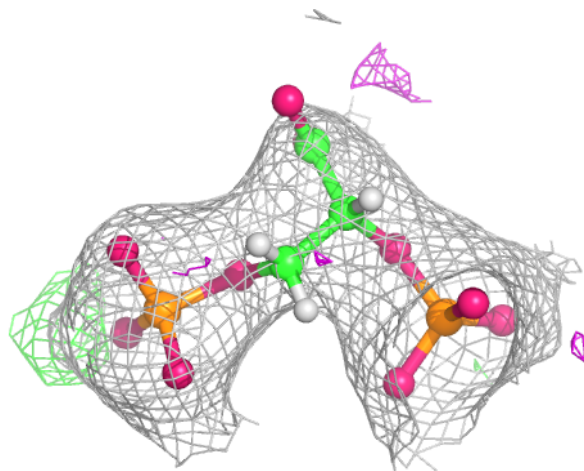
**Electron density around MG AAA 507:**

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



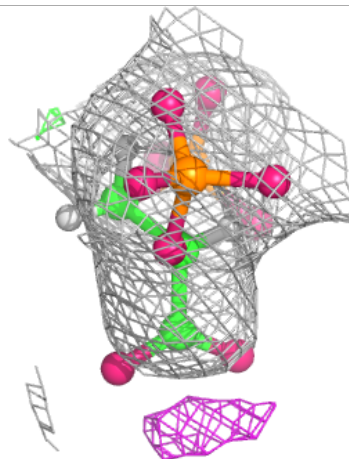
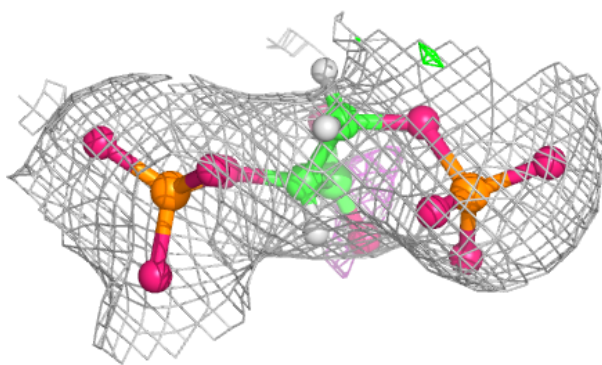
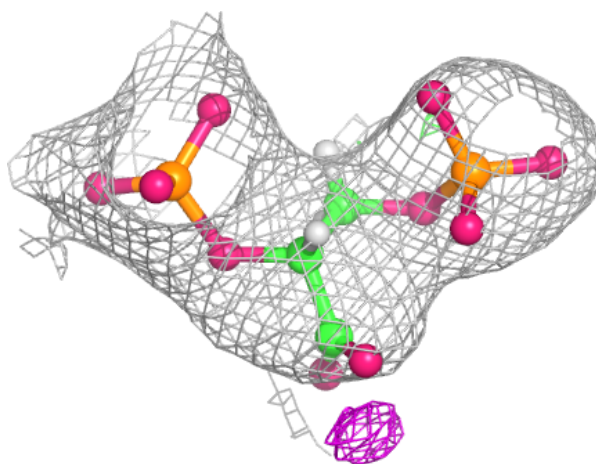
**Electron density around DG2 AAA 504:**

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



**Electron density around DG2 CCC 503:**

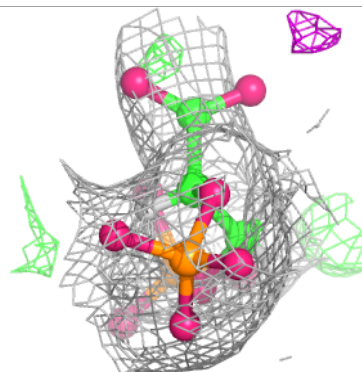
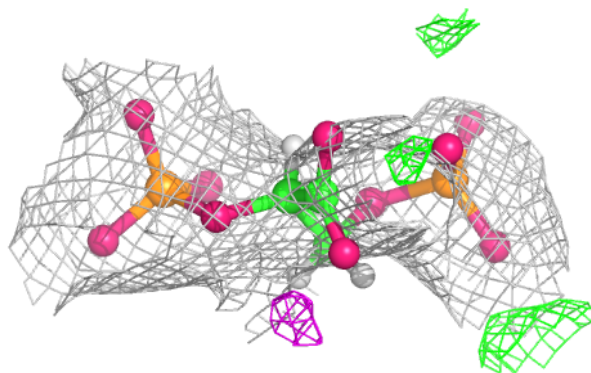
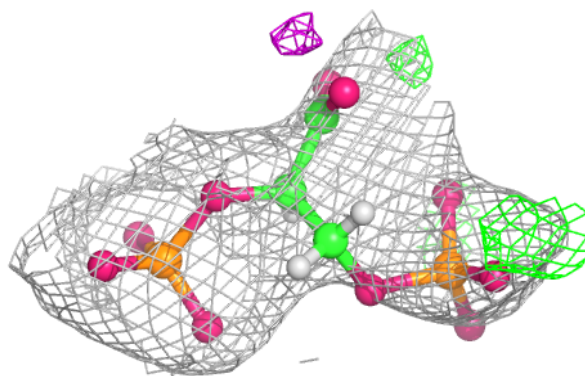
$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)



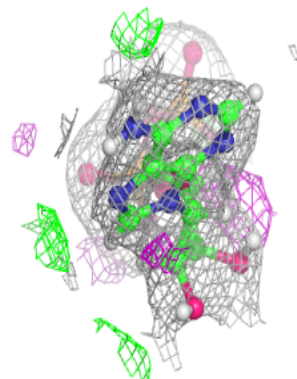
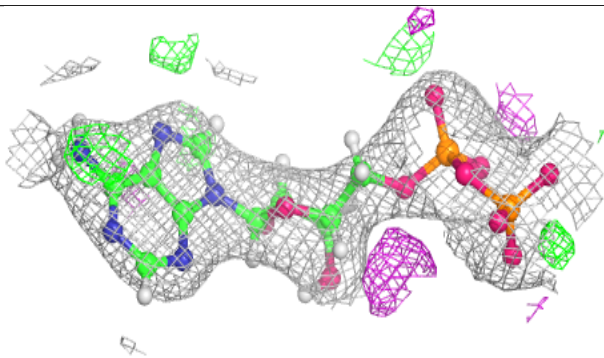
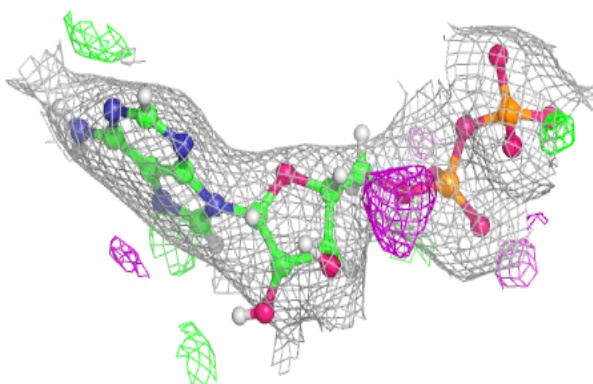


**Electron density around DG2 DDD 503:**

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

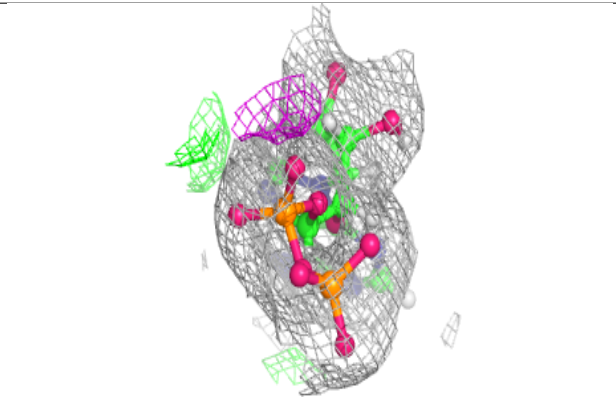
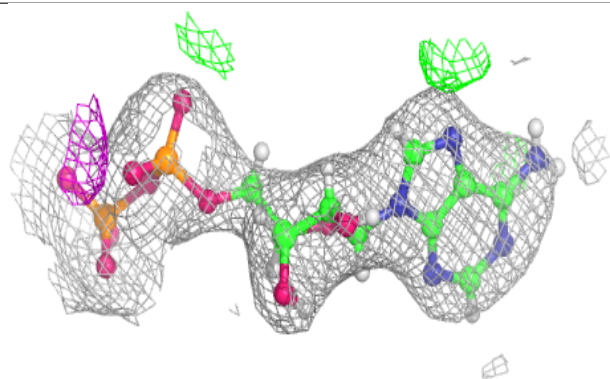
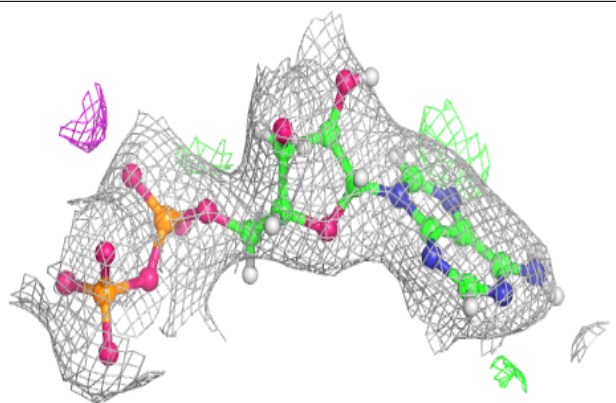
**Electron density around ADP BBB 603:**

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

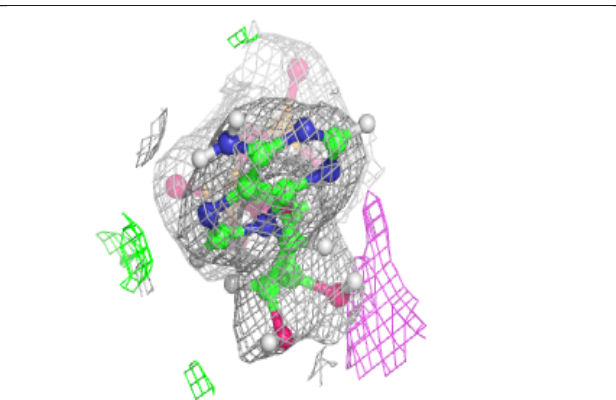
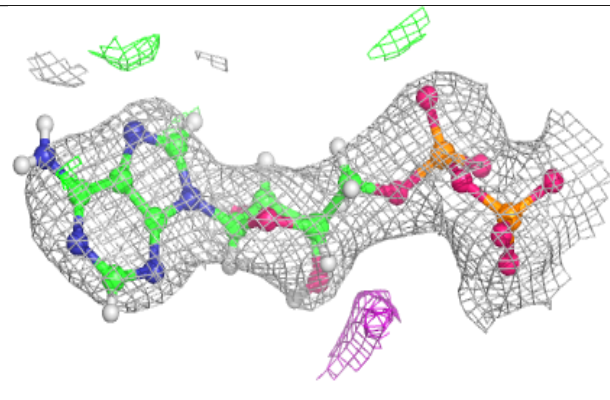
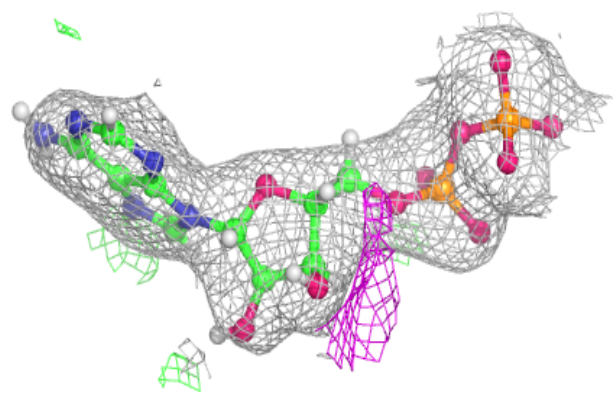


**Electron density around ADP CCC 501:**

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

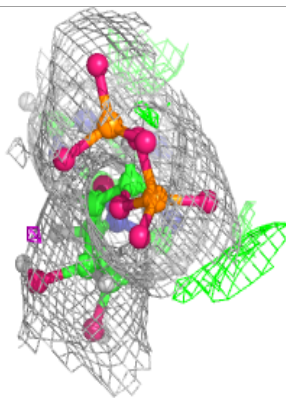
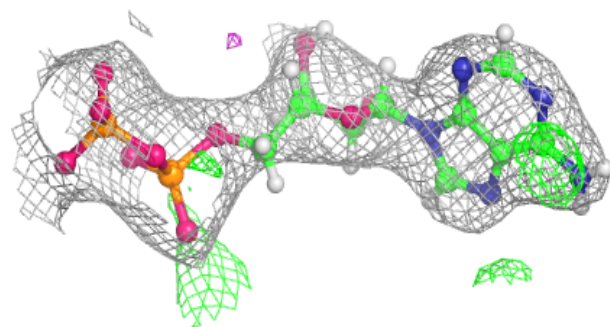
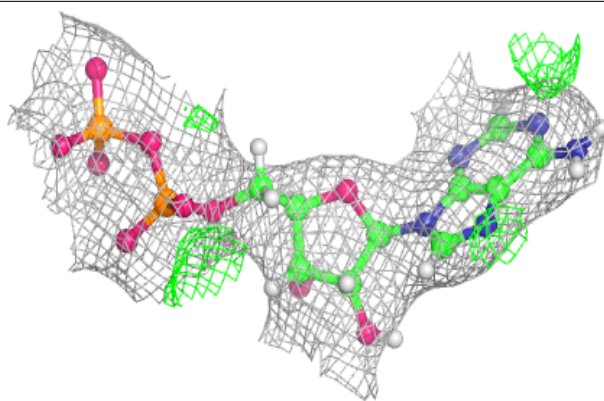
**Electron density around ADP AAA 501:**

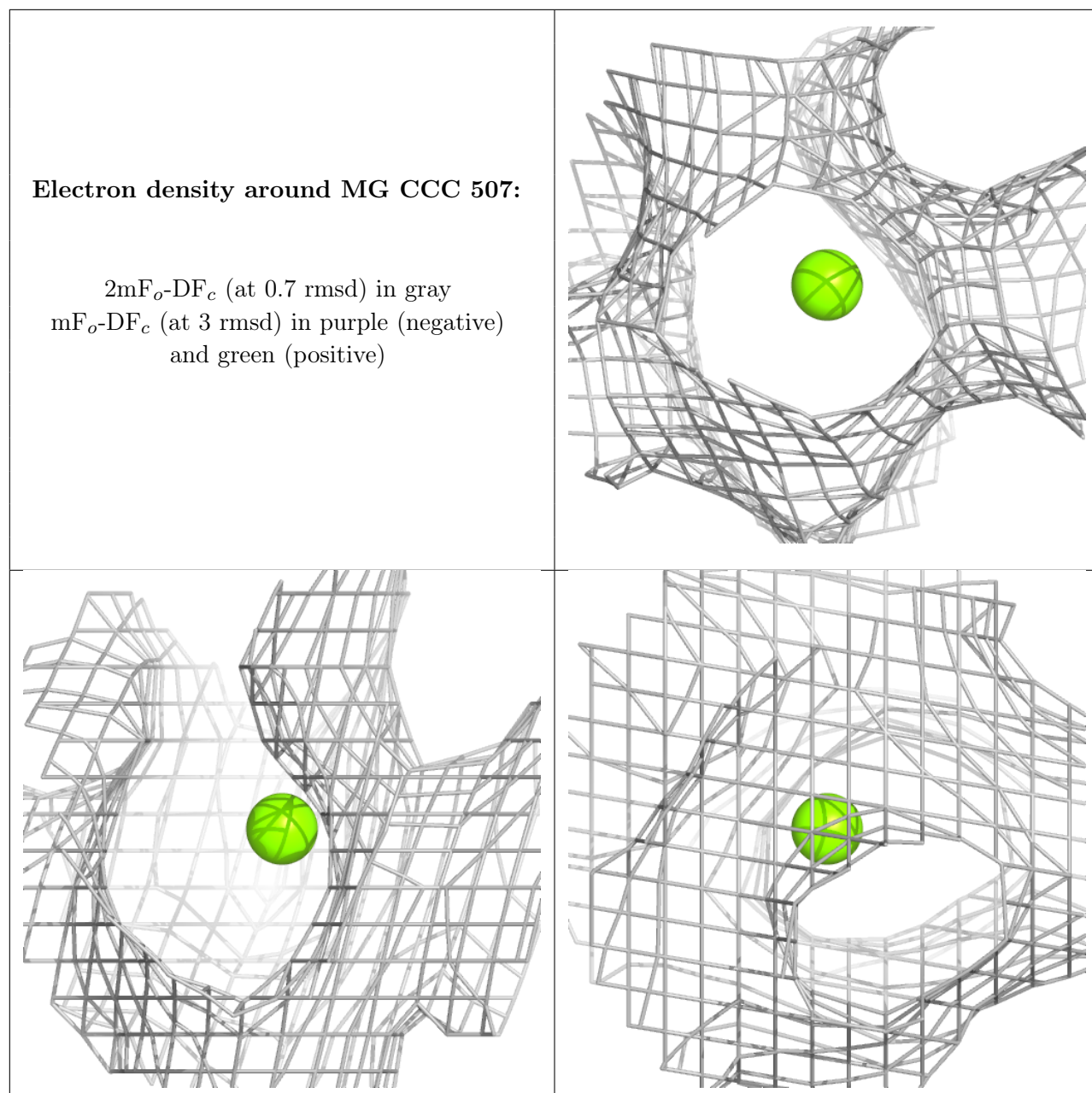
$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)



**Electron density around ADP DDD 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 [i](#)

There are no such residues in this entry.