



# Full wwPDB X-ray Structure Validation Report ⓘ

Nov 6, 2025 – 12:23 pm GMT

PDB ID : 9HS1 / pdb\_00009hs1  
Title : Crystal structure of the Escherichia coli nucleosidase PpnN (partial alarmone form)  
Authors : Baerentsen, R.L.; Brodersen, D.E.  
Deposited on : 2024-12-18  
Resolution : 2.36 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 : 4-5-2 with Phenix2.0  
Mogul : 1.8.4, CSD as541be (2020)  
Xtriage (Phenix) : 2.0  
EDS : 3.0  
buster-report : 1.1.7 (2018)  
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)  
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) : 2.46

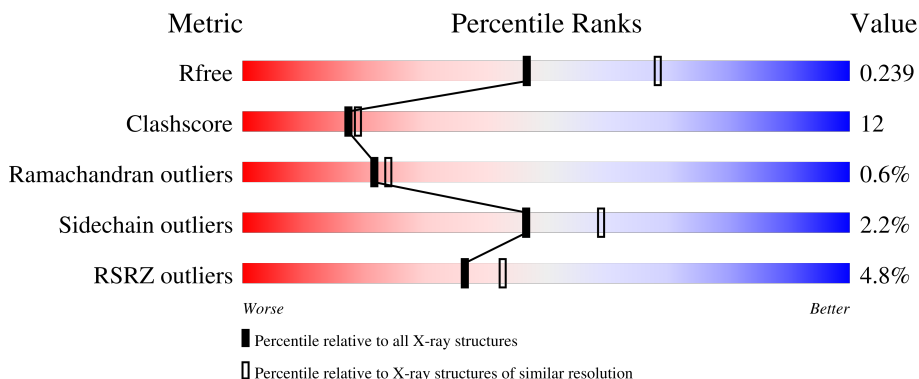
# 1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.36 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))
$R_{free}$	164625	1460 (2.36-2.36)
Clashscore	180529	1571 (2.36-2.36)
Ramachandran outliers	177936	1559 (2.36-2.36)
Sidechain outliers	177891	1559 (2.36-2.36)
RSRZ outliers	164620	1460 (2.36-2.36)

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  $\geq 3$ , 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	459	<div style="display: flex; align-items: center;"> <div style="width: 7%; height: 10px; background-color: red; margin-right: 5px;"></div> <div style="width: 76%; height: 10px; background-color: green; margin-right: 5px;"></div> <div style="width: 22%; height: 10px; background-color: yellow; margin-right: 5px;"></div> <div style="width: 3%; height: 10px; background-color: grey; margin-right: 5px;"></div> </div> <p style="margin-left: 10px;">7%      76%      22%      ..</p>
1	B	459	<div style="display: flex; align-items: center;"> <div style="width: 3%; height: 10px; background-color: red; margin-right: 5px;"></div> <div style="width: 75%; height: 10px; background-color: green; margin-right: 5px;"></div> <div style="width: 24%; height: 10px; background-color: yellow; margin-right: 5px;"></div> <div style="width: 8%; height: 10px; background-color: grey; margin-right: 5px;"></div> </div> <p style="margin-left: 10px;">3%      75%      24%      .</p>
1	C	459	<div style="display: flex; align-items: center;"> <div style="width: 6%; height: 10px; background-color: red; margin-right: 5px;"></div> <div style="width: 71%; height: 10px; background-color: green; margin-right: 5px;"></div> <div style="width: 24%; height: 10px; background-color: yellow; margin-right: 5px;"></div> <div style="width: 1%; height: 10px; background-color: grey; margin-right: 5px;"></div> </div> <p style="margin-left: 10px;">6%      71%      24%      ..</p>
1	D	459	<div style="display: flex; align-items: center;"> <div style="width: 3%; height: 10px; background-color: red; margin-right: 5px;"></div> <div style="width: 74%; height: 10px; background-color: green; margin-right: 5px;"></div> <div style="width: 22%; height: 10px; background-color: yellow; margin-right: 5px;"></div> <div style="width: 1%; height: 10px; background-color: grey; margin-right: 5px;"></div> </div> <p style="margin-left: 10px;">3%      74%      22%      ..</p>

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
3	GUN	A	502	-	X	X	-
3	GUN	B	502	-	-	X	-
3	GUN	C	501	-	X	X	-

## 2 Entry composition [i](#)

There are 5 unique types of molecules in this entry. The entry contains 14688 atoms, of which 48 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 Pyrimidine/purine nucleotide 5'-monophosphate nucleosidase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	454	3578	2265	638	652	23	0	0	0
1	B	454	3570	2260	634	653	23	0	0	0
1	C	444	3506	2221	624	639	22	0	0	0
1	D	448	3521	2230	625	643	23	0	0	0

There are 24 discrepancies between the modelled and reference sequences:

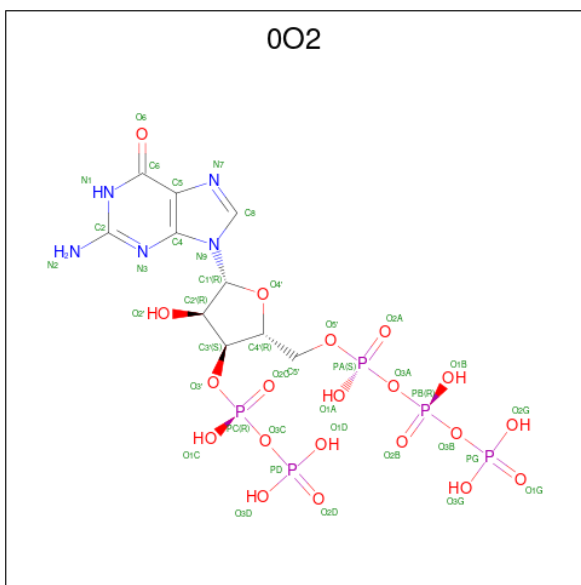
Chain	Residue	Modelled	Actual	Comment	Reference
A	-4	MET	-	initiating methionine	UNP P0ADR8
A	-3	PRO	-	expression tag	UNP P0ADR8
A	-2	ALA	-	expression tag	UNP P0ADR8
A	-1	LEU	-	expression tag	UNP P0ADR8
A	0	ARG	-	expression tag	UNP P0ADR8
A	1	ALA	-	expression tag	UNP P0ADR8
B	-4	MET	-	initiating methionine	UNP P0ADR8
B	-3	PRO	-	expression tag	UNP P0ADR8
B	-2	ALA	-	expression tag	UNP P0ADR8
B	-1	LEU	-	expression tag	UNP P0ADR8
B	0	ARG	-	expression tag	UNP P0ADR8
B	1	ALA	-	expression tag	UNP P0ADR8
C	-4	MET	-	initiating methionine	UNP P0ADR8
C	-3	PRO	-	expression tag	UNP P0ADR8
C	-2	ALA	-	expression tag	UNP P0ADR8
C	-1	LEU	-	expression tag	UNP P0ADR8
C	0	ARG	-	expression tag	UNP P0ADR8
C	1	ALA	-	expression tag	UNP P0ADR8
D	-4	MET	-	initiating methionine	UNP P0ADR8
D	-3	PRO	-	expression tag	UNP P0ADR8
D	-2	ALA	-	expression tag	UNP P0ADR8

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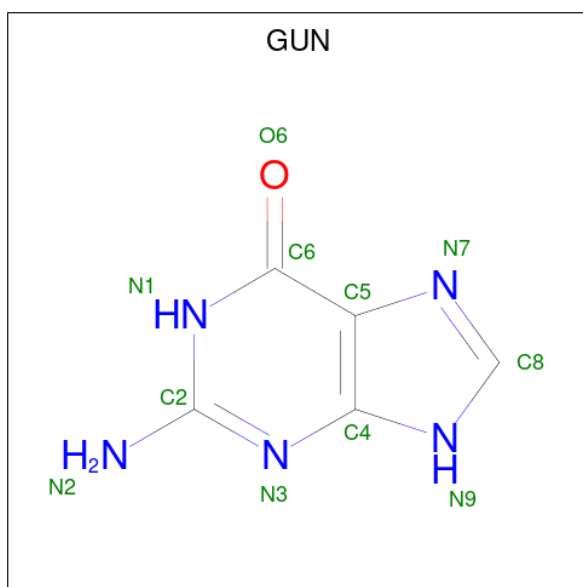
Chain	Residue	Modelled	Actual	Comment	Reference
D	-1	LEU	-	expression tag	UNP P0ADR8
D	0	ARG	-	expression tag	UNP P0ADR8
D	1	ALA	-	expression tag	UNP P0ADR8

- Molecule 2 is guanosine 5'-(tetrahydrogen triphosphate) 3'-(trihydrogen diphosphate) (CCD ID: 0O2) (formula: C<sub>10</sub>H<sub>18</sub>N<sub>5</sub>O<sub>20</sub>P<sub>5</sub>) (labeled as "Ligand of Interest" by depositor).



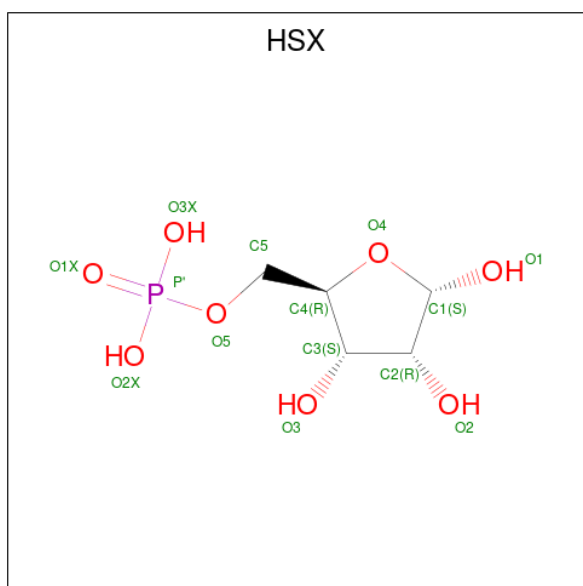
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	
			Total	C	H	N	O			P
2	A	1	Total	C	H	N	O	P	0	0
			51	10	11	5	20	5		
2	B	1	Total	C	H	N	O	P	0	0
			51	10	11	5	20	5		
2	C	1	Total	C	H	N	O	P	0	0
			51	10	11	5	20	5		

- Molecule 3 is GUANINE (CCD ID: GUN) (formula: C<sub>5</sub>H<sub>5</sub>N<sub>5</sub>O) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	
			Total	C	H	N			O
3	A	1	Total	C	H	N	O	0	0
			16	5	5	5	1		
3	B	1	Total	C	H	N	O	0	0
			16	5	5	5	1		
3	C	1	Total	C	H	N	O	0	0
			16	5	5	5	1		

- Molecule 4 is 5-O-phosphono-alpha-D-ribofuranose (CCD ID: HSX) (formula: C<sub>5</sub>H<sub>11</sub>O<sub>8</sub>P) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
4	D	1	Total	C	O	P	0	0
			14	5	8	1		

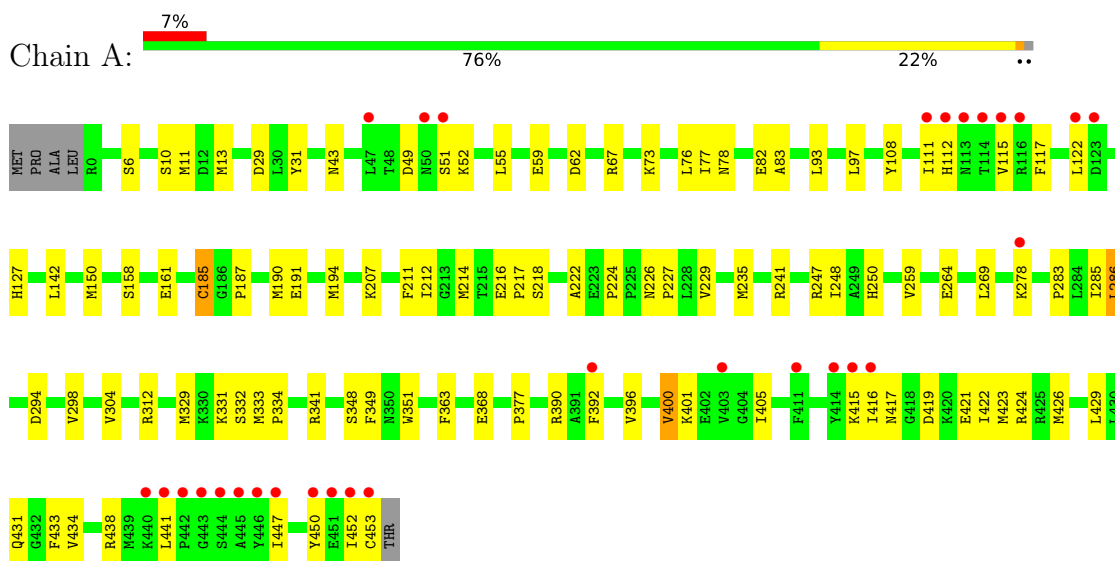
- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	71	Total	O	0	0
			71	71		
5	B	79	Total	O	0	0
			79	79		
5	C	71	Total	O	0	0
			71	71		
5	D	77	Total	O	0	0
			77	77		

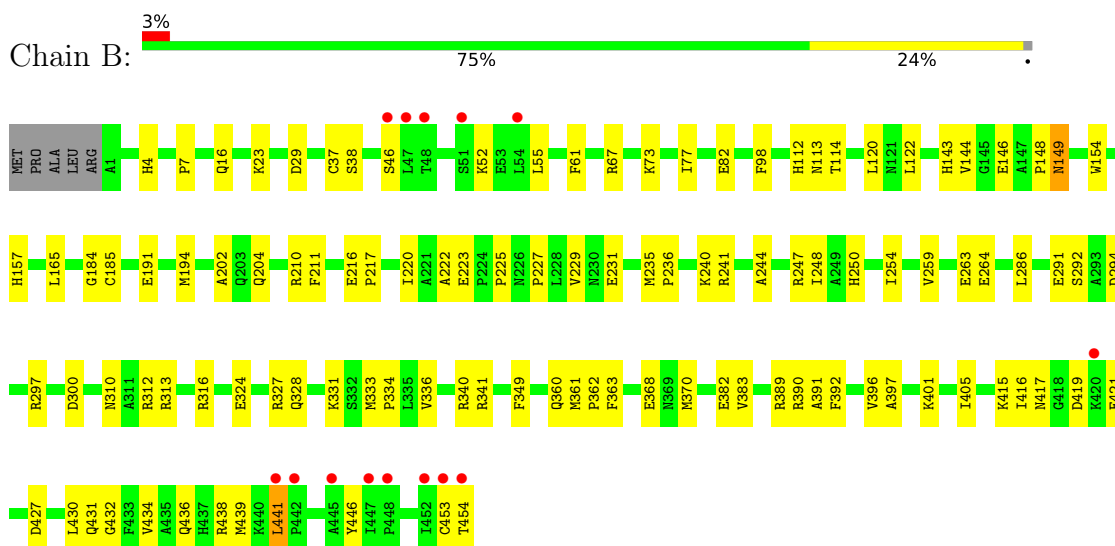
### 3 Residue-property plots [i](#)

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: Pyrimidine/purine nucleotide 5'-monophosphate nucleosidase



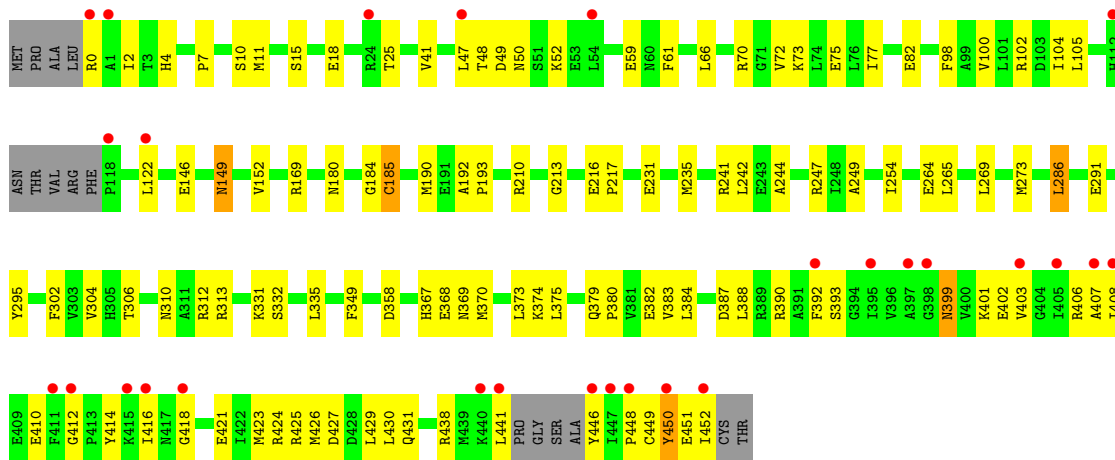
- Molecule 1: Pyrimidine/purine nucleotide 5'-monophosphate nucleosidase



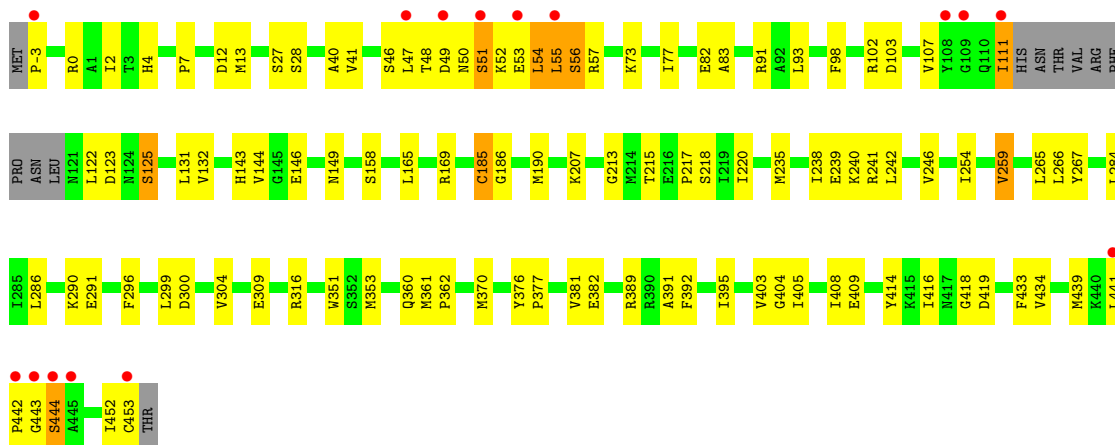
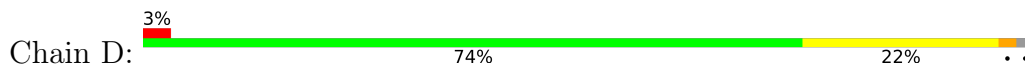
- Molecule 1: Pyrimidine/purine nucleotide 5'-monophosphate nucleosidase







● Molecule 1: Pyrimidine/purine nucleotide 5'-monophosphate nucleosidase



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 43 21 2	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	152.66Å 152.66Å 224.54Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	49.63 – 2.36 49.63 – 2.36	Depositor EDS
% Data completeness (in resolution range)	99.9 (49.63-2.36) 99.9 (49.63-2.36)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.08 (at 2.37Å)	Xtrriage
Refinement program	PHENIX 1.20.1_4487, PHENIX 1.20.1_4487	Depositor
R, $R_{free}$	0.194 , 0.241 0.195 , 0.239	Depositor DCC
$R_{free}$ test set	5439 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	56.3	Xtrriage
Anisotropy	0.186	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.36 , 45.2	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	14688	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	63.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.43% 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: HSX, OO2, GUN

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	0.39	1/3648 (0.0%)	0.55	0/4936
1	B	0.39	0/3640	0.52	2/4928 (0.0%)
1	C	0.34	0/3572	0.48	0/4828
1	D	0.40	0/3588	0.52	0/4852
All	All	0.38	1/14448 (0.0%)	0.52	2/19544 (0.0%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	224	PRO	CA-C	5.57	1.54	1.51

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	360	GLN	CA-C-N	-5.00	111.99	123.15
1	B	360	GLN	C-N-CA	-5.00	111.99	123.15

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	3578	0	3607	86	1

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	B	3570	0	3590	87	0
1	C	3506	0	3537	99	0
1	D	3521	0	3554	85	1
2	A	40	11	11	3	0
2	B	40	11	13	2	0
2	C	40	11	12	0	1
3	A	11	5	5	7	0
3	B	11	5	5	4	0
3	C	11	5	5	5	0
4	D	14	0	0	0	0
5	A	71	0	0	4	0
5	B	79	0	0	5	0
5	C	71	0	0	6	0
5	D	77	0	0	6	0
All	All	14640	48	14339	353	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 12.

All (353) 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:316:ARG:NH1	1:B:328:GLN:OE1	1.87	1.06
1:C:427:ASP:OD1	1:C:450:TYR:OH	1.71	1.06
1:C:358:ASP:HB2	1:C:390:ARG:HH12	1.22	1.05
1:B:291:GLU:OE1	1:B:291:GLU:N	1.96	0.97
1:D:259:VAL:HG22	1:D:439:MET:HE1	1.47	0.95
1:A:82:GLU:OE2	1:A:82:GLU:N	1.99	0.94
1:C:291:GLU:N	1:C:291:GLU:OE2	2.01	0.93
1:B:361:MET:HG3	1:B:362:PRO:HD2	1.53	0.90
1:C:216:GLU:HG2	1:C:217:PRO:HD2	1.51	0.90
1:C:401:LYS:HE3	1:C:401:LYS:HA	1.55	0.89
1:D:353:MET:HG2	5:D:677:HOH:O	1.70	0.89
1:D:405:ILE:O	1:D:409:GLU:HG2	1.74	0.88
1:B:392:PHE:O	1:B:396:VAL:HG23	1.74	0.88
1:D:291:GLU:OE2	1:D:291:GLU:N	2.08	0.87
1:C:269:LEU:O	1:C:273:MET:HG3	1.73	0.86
1:B:316:ARG:NH1	1:B:328:GLN:CD	2.37	0.81
1:A:216:GLU:OE1	1:A:218:SER:HB2	1.81	0.81
1:C:451:GLU:C	1:C:452:ILE:HD12	2.05	0.80
1:D:439:MET:HE2	1:D:439:MET:HA	1.63	0.80

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:241:ARG:HD3	3:C:501:GUN:HN22	1.46	0.80
1:B:294:ASP:OD1	1:B:297:ARG:NH2	2.13	0.80
1:A:73:LYS:HE3	2:B:501:O02:O1G	1.83	0.79
1:B:370:MET:HE1	1:B:391:ALA:HA	1.64	0.79
1:B:316:ARG:HH12	1:B:328:GLN:CD	1.91	0.79
1:C:358:ASP:HB2	1:C:390:ARG:NH1	1.97	0.79
1:C:392:PHE:CD1	1:C:426:MET:HE3	2.18	0.78
1:C:216:GLU:HG2	1:C:217:PRO:CD	2.14	0.77
1:D:246:VAL:HG12	5:D:677:HOH:O	1.84	0.77
1:A:368:GLU:OE1	1:A:368:GLU:N	2.15	0.77
1:C:380:PRO:HB2	1:C:383:VAL:HG23	1.68	0.76
1:B:210:ARG:HD2	1:B:231:GLU:OE2	1.84	0.76
1:C:59:GLU:OE2	1:C:59:GLU:N	2.16	0.74
1:B:194:MET:HE2	1:B:211:PHE:HB3	1.70	0.74
1:A:392:PHE:CZ	1:A:429:LEU:HD23	2.22	0.74
1:C:146:GLU:OE2	1:C:146:GLU:HA	1.87	0.74
1:A:298:VAL:HG12	1:A:429:LEU:HD12	1.69	0.74
1:B:368:GLU:OE1	1:B:368:GLU:N	2.19	0.74
1:A:241:ARG:HD3	3:A:502:GUN:HN22	1.53	0.72
1:C:15:SER:OG	1:C:18:GLU:HG3	1.89	0.72
1:B:52:LYS:HE3	1:B:222:ALA:HB1	1.70	0.72
1:B:417:ASN:ND2	1:B:453:CYS:O	2.23	0.71
1:C:50:ASN:HD21	1:C:52:LYS:HG2	1.55	0.71
1:B:235:MET:HE3	1:B:236:PRO:HD2	1.73	0.71
1:C:302:PHE:O	1:C:306:THR:HG23	1.91	0.71
1:B:235:MET:HE3	1:B:236:PRO:CD	2.21	0.70
1:A:285:ILE:HD12	1:A:329:MET:HE2	1.74	0.70
1:B:220:ILE:HD11	1:B:225:PRO:HD3	1.74	0.69
1:C:392:PHE:HZ	1:C:429:LEU:HD23	1.56	0.69
1:B:397:ALA:CB	1:B:401:LYS:HE2	2.24	0.68
1:B:397:ALA:HB1	1:B:401:LYS:HE2	1.76	0.68
1:C:82:GLU:CD	1:C:82:GLU:H	2.02	0.68
1:A:392:PHE:HZ	1:A:429:LEU:HD23	1.58	0.67
1:B:120:LEU:HD21	1:B:122:LEU:HD21	1.76	0.67
1:C:392:PHE:CZ	1:C:429:LEU:HD23	2.30	0.67
1:D:125:SER:HB2	5:D:655:HOH:O	1.93	0.67
1:A:298:VAL:HG12	1:A:429:LEU:CD1	2.24	0.67
1:A:396:VAL:O	1:A:400:VAL:HG22	1.95	0.67
1:C:169:ARG:NH2	5:C:601:HOH:O	2.28	0.67
1:A:13:MET:HE2	1:B:144:VAL:HG22	1.77	0.67
1:A:401:LYS:O	1:A:405:ILE:HG13	1.95	0.66

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:417:ASN:HD21	1:B:454:THR:HA	1.60	0.66
1:A:294:ASP:HB2	5:A:625:HOH:O	1.95	0.66
1:B:316:ARG:HH12	1:B:328:GLN:NE2	1.93	0.66
1:D:304:VAL:HG13	1:D:309:GLU:HA	1.77	0.66
1:B:310:ASN:HB2	5:B:628:HOH:O	1.96	0.65
1:C:70:ARG:HG3	1:D:351:TRP:CD1	2.31	0.65
1:C:310:ASN:O	1:C:313:ARG:HG3	1.96	0.65
1:D:102:ARG:O	1:D:107:VAL:HG23	1.96	0.65
1:A:298:VAL:CG1	1:A:429:LEU:HD12	2.26	0.65
1:C:217:PRO:HD3	1:C:235:MET:O	1.97	0.64
1:B:146:GLU:OE2	1:B:146:GLU:HA	1.97	0.64
1:A:341:ARG:HH22	2:A:501:O02:PD	2.21	0.64
1:C:4:HIS:CD2	1:C:75:GLU:HG3	2.32	0.64
1:C:25:THR:HG22	1:C:105:LEU:HD22	1.80	0.64
2:A:501:O02:O1A	1:B:73:LYS:NZ	2.31	0.64
1:A:421:GLU:OE2	1:A:424:ARG:NH2	2.31	0.64
1:D:4:HIS:HB3	1:D:73:LYS:HE2	1.80	0.64
1:C:185:CYS:HB2	1:C:213:GLY:HA3	1.79	0.63
1:C:423:MET:HE2	1:C:450:TYR:CD2	2.34	0.63
1:D:143:HIS:HB2	1:D:146:GLU:HG2	1.79	0.63
1:C:406:ARG:HB3	1:C:410:GLU:OE2	1.99	0.63
1:B:184:GLY:O	1:B:185:CYS:HB3	1.99	0.63
1:D:186:GLY:HA3	1:D:190:MET:HE3	1.81	0.62
1:C:331:LYS:NZ	5:C:602:HOH:O	2.32	0.62
1:D:82:GLU:CD	1:D:82:GLU:H	2.06	0.62
1:D:235:MET:CE	1:D:240:LYS:HB3	2.29	0.62
1:C:402:GLU:O	1:C:406:ARG:HG2	2.00	0.62
1:B:235:MET:HE2	1:B:240:LYS:HB3	1.80	0.61
1:A:115:VAL:HG22	1:A:117:PHE:H	1.65	0.61
1:D:304:VAL:CG1	1:D:309:GLU:HG3	2.31	0.61
1:D:13:MET:HE3	1:D:13:MET:HA	1.82	0.61
1:A:416:ILE:CD1	1:A:450:TYR:HB2	2.31	0.61
1:B:300:ASP:OD2	1:B:312:ARG:NH2	2.32	0.61
1:C:242:LEU:CD2	3:C:501:GUN:HN21	2.13	0.61
1:C:50:ASN:ND2	1:C:52:LYS:HG2	2.14	0.61
1:A:417:ASN:OD1	1:A:417:ASN:O	2.19	0.60
1:C:368:GLU:HG3	1:C:369:ASN:N	2.15	0.60
1:C:401:LYS:HE3	1:C:401:LYS:CA	2.31	0.60
1:C:235:MET:HE3	1:C:244:ALA:HB2	1.82	0.60
1:C:408:ILE:HD11	1:C:414:TYR:CD2	2.37	0.60
1:A:76:LEU:HD21	1:A:97:LEU:HD21	1.84	0.60

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:292:SER:HB3	5:B:645:HOH:O	2.02	0.59
1:D:416:ILE:HD12	1:D:452:ILE:CD1	2.33	0.59
1:C:399:ASN:ND2	1:C:449:CYS:SG	2.76	0.59
1:B:184:GLY:O	1:B:185:CYS:CB	2.49	0.59
1:C:0:ARG:O	1:C:2:ILE:HD12	2.03	0.59
1:D:217:PRO:HD3	1:D:235:MET:O	2.03	0.59
1:B:430:LEU:O	1:B:434:VAL:HG23	2.03	0.58
1:B:148:PRO:HB3	1:B:250:HIS:CD2	2.37	0.58
1:C:122:LEU:HG	5:C:610:HOH:O	2.03	0.58
1:D:300:ASP:O	1:D:304:VAL:HG23	2.03	0.58
1:C:304:VAL:HG21	1:C:312:ARG:CZ	2.34	0.58
1:A:111:ILE:HG22	1:A:112:HIS:CE1	2.38	0.58
1:A:431:GLN:O	1:A:434:VAL:HG22	2.04	0.58
1:B:324:GLU:HG3	1:B:328:GLN:NE2	2.19	0.57
1:D:286:LEU:HB3	1:D:296:PHE:CE1	2.39	0.57
1:A:217:PRO:HD3	1:A:235:MET:O	2.04	0.57
1:B:419:ASP:OD1	1:B:421:GLU:N	2.34	0.57
1:D:48:THR:HG22	1:D:49:ASP:N	2.20	0.57
1:D:416:ILE:HD12	1:D:452:ILE:HD13	1.87	0.57
1:A:392:PHE:O	1:A:396:VAL:HG23	2.05	0.56
1:B:324:GLU:OE1	1:B:327:ARG:NH1	2.37	0.56
1:C:375:LEU:HD23	1:C:375:LEU:N	2.19	0.56
1:D:215:THR:HA	1:D:241:ARG:HE	1.70	0.56
1:D:259:VAL:HG12	1:D:392:PHE:HD1	1.70	0.56
1:D:54:LEU:O	1:D:56:SER:N	2.38	0.56
1:C:264:GLU:CD	3:C:501:GUN:O6	2.49	0.56
1:C:414:TYR:N	1:C:449:CYS:O	2.37	0.56
1:D:377:PRO:HD3	1:D:419:ASP:HB2	1.87	0.56
1:C:401:LYS:HA	1:C:401:LYS:CE	2.23	0.56
1:D:254:ILE:HD12	1:D:284:LEU:HD11	1.88	0.55
1:B:241:ARG:NH1	3:B:502:GUN:HN22	2.04	0.55
1:D:246:VAL:CG1	5:D:677:HOH:O	2.49	0.55
1:B:436:GLN:HB2	1:B:438:ARG:HG2	1.89	0.55
1:A:115:VAL:HB	5:B:666:HOH:O	2.06	0.55
1:C:373:LEU:HD22	1:C:387:ASP:OD1	2.07	0.55
1:C:149:ASN:HD21	1:C:180:ASN:ND2	2.04	0.55
1:D:370:MET:HE1	1:D:391:ALA:HA	1.88	0.54
1:C:11:MET:HE3	1:C:102:ARG:HG3	1.90	0.54
1:D:111:ILE:O	1:D:111:ILE:HG23	2.07	0.54
1:A:51:SER:O	1:A:55:LEU:HG	2.08	0.54
1:A:419:ASP:O	1:A:423:MET:HG2	2.06	0.54

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:264:GLU:CD	3:A:502:GUN:O6	2.50	0.54
1:D:235:MET:HE2	1:D:240:LYS:HB3	1.90	0.54
1:C:295:TYR:CD1	1:C:438:ARG:HD2	2.43	0.54
1:B:4:HIS:HB3	1:B:73:LYS:HE2	1.89	0.53
1:D:185:CYS:HB2	1:D:213:GLY:HA3	1.91	0.53
1:C:379:GLN:OE1	1:C:379:GLN:HA	2.08	0.53
1:C:441:LEU:CD2	1:C:446:TYR:HA	2.38	0.53
1:C:10:SER:HB3	5:C:654:HOH:O	2.08	0.53
1:C:392:PHE:HD1	1:C:426:MET:HE3	1.70	0.53
1:A:241:ARG:CD	3:A:502:GUN:HN22	2.22	0.53
1:A:150:MET:HE3	1:A:212:ILE:HD12	1.90	0.53
1:C:254:ILE:HB	1:C:286:LEU:HD22	1.90	0.53
1:D:40:ALA:HA	1:D:54:LEU:HD21	1.91	0.53
1:A:304:VAL:HG21	1:A:312:ARG:NH1	2.24	0.53
1:A:416:ILE:HD11	1:A:450:TYR:HB2	1.90	0.53
1:B:427:ASP:O	1:B:431:GLN:HB2	2.08	0.53
1:B:220:ILE:O	1:B:220:ILE:HG13	2.09	0.53
1:D:50:ASN:O	1:D:52:LYS:N	2.40	0.53
1:B:194:MET:HE1	1:B:229:VAL:HG22	1.91	0.52
1:B:235:MET:HE3	1:B:236:PRO:HD3	1.92	0.52
1:C:190:MET:HG2	5:C:632:HOH:O	2.08	0.52
1:D:123:ASP:O	1:D:361:MET:HE1	2.10	0.52
1:B:264:GLU:CD	3:B:502:GUN:O6	2.52	0.52
1:D:48:THR:HB	1:D:53:GLU:HG3	1.92	0.52
1:B:23:LYS:HD3	1:B:67:ARG:NH1	2.24	0.51
1:A:190:MET:HG2	5:A:626:HOH:O	2.09	0.51
1:A:351:TRP:CE3	1:B:16:GLN:HG3	2.45	0.51
1:A:250:HIS:HB2	1:A:333:MET:HE1	1.92	0.51
1:A:416:ILE:HD11	1:A:450:TYR:CB	2.41	0.51
1:C:402:GLU:OE2	1:C:403:VAL:HG13	2.11	0.51
1:D:376:TYR:CZ	1:D:418:GLY:HA2	2.44	0.51
1:A:83:ALA:HB1	1:A:93:LEU:HD12	1.93	0.51
1:A:452:ILE:HG22	1:A:453:CYS:N	2.25	0.51
1:A:185:CYS:HB2	1:A:229:VAL:HG21	1.93	0.51
1:C:242:LEU:HD21	3:C:501:GUN:HN21	1.75	0.51
2:A:501:OO2:O2A	2:A:501:OO2:O1C	2.29	0.50
1:A:29:ASP:N	1:A:29:ASP:OD2	2.44	0.50
1:B:382:GLU:HG2	1:B:383:VAL:N	2.25	0.50
1:B:29:ASP:OD2	1:B:29:ASP:N	2.44	0.50
1:B:112:HIS:O	1:B:113:ASN:HB2	2.11	0.50
1:A:31:TYR:OH	1:A:62:ASP:OD1	2.14	0.50

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:111:ILE:HG22	1:A:112:HIS:CD2	2.47	0.50
1:C:247:ARG:HD2	1:C:349:PHE:CZ	2.46	0.50
1:A:241:ARG:HD3	3:A:502:GUN:N2	2.24	0.49
1:D:403:VAL:HG13	1:D:404:GLY:N	2.26	0.49
1:B:202:ALA:HB3	5:B:674:HOH:O	2.12	0.49
1:D:132:VAL:HG22	1:D:235:MET:HE1	1.94	0.49
1:B:55:LEU:N	1:B:55:LEU:HD23	2.27	0.49
1:A:247:ARG:HD2	1:A:349:PHE:CZ	2.48	0.49
1:D:404:GLY:O	1:D:408:ILE:HG12	2.12	0.49
1:B:313:ARG:NH1	1:B:313:ARG:HG2	2.28	0.49
1:C:406:ARG:O	1:C:410:GLU:HB2	2.13	0.49
1:C:427:ASP:O	1:C:431:GLN:HB2	2.13	0.48
1:D:51:SER:H	1:D:54:LEU:HD12	1.77	0.48
1:D:207:LYS:HA	5:D:649:HOH:O	2.13	0.48
1:B:154:TRP:CD2	3:B:502:GUN:O6	2.66	0.48
1:B:244:ALA:O	1:B:248:ILE:HG12	2.14	0.48
1:A:150:MET:HE3	1:A:212:ILE:CD1	2.44	0.48
1:B:82:GLU:CD	1:B:82:GLU:H	2.20	0.48
1:C:382:GLU:HG2	1:C:383:VAL:N	2.28	0.48
1:C:446:TYR:CE2	1:C:448:PRO:HG3	2.49	0.48
1:D:304:VAL:HG11	1:D:309:GLU:HG3	1.95	0.48
1:B:216:GLU:HB2	1:B:217:PRO:CD	2.44	0.48
1:B:316:ARG:NH1	1:B:328:GLN:NE2	2.59	0.48
1:A:351:TRP:CZ3	1:B:16:GLN:HG3	2.49	0.48
1:D:132:VAL:HG22	1:D:235:MET:CE	2.44	0.48
1:D:239:GLU:CD	1:D:362:PRO:HA	2.39	0.48
1:C:122:LEU:HG	1:C:122:LEU:O	2.14	0.48
1:A:241:ARG:NH1	3:A:502:GUN:HN22	2.11	0.47
1:B:419:ASP:OD1	1:B:421:GLU:HB3	2.14	0.47
1:B:401:LYS:O	1:B:405:ILE:HG13	2.14	0.47
1:C:184:GLY:O	1:C:185:CYS:HB3	2.14	0.47
1:B:157:HIS:HE1	1:B:223:GLU:OE1	1.97	0.47
1:A:363:PHE:CG	1:A:390:ARG:HD2	2.49	0.47
1:A:426:MET:HB2	1:A:426:MET:HE2	1.70	0.47
1:B:415:LYS:CB	5:B:678:HOH:O	2.63	0.47
1:A:10:SER:O	1:A:11:MET:HB2	2.14	0.47
1:A:83:ALA:CB	1:A:93:LEU:HD12	2.45	0.47
1:C:265:LEU:O	1:C:265:LEU:HD12	2.15	0.47
1:C:408:ILE:HD12	1:C:449:CYS:HB3	1.96	0.47
1:D:381:VAL:HG13	1:D:382:GLU:N	2.29	0.47
1:A:283:PRO:HG3	1:A:332:SER:HB3	1.97	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:331:LYS:O	1:A:334:PRO:HD2	2.15	0.47
1:B:254:ILE:HB	1:B:286:LEU:HD22	1.96	0.47
1:A:377:PRO:HG3	1:A:422:ILE:HD11	1.96	0.47
1:C:418:GLY:O	1:C:452:ILE:HG23	2.15	0.47
1:D:122:LEU:HD11	1:D:131:LEU:HD22	1.97	0.47
1:D:377:PRO:HD3	1:D:419:ASP:CB	2.45	0.47
1:A:52:LYS:HE2	1:A:222:ALA:HB1	1.96	0.46
1:C:421:GLU:OE1	1:C:424:ARG:NH2	2.48	0.46
1:B:441:LEU:HD13	1:B:446:TYR:HA	1.97	0.46
1:D:316:ARG:HE	1:D:316:ARG:HB2	1.58	0.46
1:D:443:GLY:O	1:D:444:SER:CB	2.62	0.46
1:C:185:CYS:HB2	1:C:213:GLY:CA	2.44	0.46
1:D:259:VAL:HG12	1:D:392:PHE:CD1	2.50	0.46
1:C:384:LEU:O	1:C:384:LEU:HD12	2.15	0.46
1:D:238:ILE:HD12	1:D:241:ARG:HD2	1.98	0.46
1:D:290:LYS:HG3	1:D:291:GLU:OE2	2.16	0.46
1:D:158:SER:OG	1:D:441:LEU:HD23	2.14	0.46
1:C:406:ARG:O	1:C:410:GLU:OE2	2.33	0.46
1:C:384:LEU:O	1:C:388:LEU:HB2	2.15	0.46
1:D:433:PHE:HB3	1:D:439:MET:HE3	1.98	0.46
1:A:161:GLU:HA	1:A:161:GLU:OE1	2.16	0.45
1:A:194:MET:HE2	1:A:211:PHE:HB3	1.98	0.45
1:A:415:LYS:NZ	1:A:453:CYS:HB2	2.31	0.45
1:C:0:ARG:C	1:C:2:ILE:HD12	2.41	0.45
1:C:450:TYR:N	1:C:450:TYR:CD1	2.84	0.45
1:D:291:GLU:N	1:D:291:GLU:CD	2.74	0.45
1:D:266:LEU:HD13	1:D:266:LEU:HA	1.80	0.45
1:C:370:MET:HG3	1:C:414:TYR:CD1	2.51	0.45
1:B:37:CYS:SG	1:B:220:ILE:HG23	2.56	0.45
1:B:361:MET:HE2	1:B:361:MET:HB2	1.85	0.45
1:C:425:ARG:HB3	5:C:624:HOH:O	2.17	0.45
1:C:302:PHE:CG	1:C:429:LEU:HD22	2.51	0.45
1:B:247:ARG:HD2	1:B:349:PHE:CZ	2.52	0.45
1:A:304:VAL:CG2	1:A:312:ARG:HD2	2.46	0.45
1:D:235:MET:HE3	1:D:240:LYS:HB3	1.99	0.45
1:C:210:ARG:HD2	1:C:231:GLU:OE2	2.17	0.44
1:B:143:HIS:HB3	1:B:146:GLU:HG2	1.99	0.44
1:C:265:LEU:HD22	1:C:286:LEU:HD11	1.99	0.44
1:D:122:LEU:N	1:D:122:LEU:HD22	2.31	0.44
1:D:391:ALA:O	1:D:395:ILE:HG13	2.17	0.44
1:A:278:LYS:HB3	1:A:278:LYS:HE2	1.46	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:259:VAL:HG11	1:B:439:MET:SD	2.58	0.44
1:B:341:ARG:NH2	2:B:501:OO2:O1B	2.50	0.44
1:A:207:LYS:HB2	1:A:207:LYS:HE3	1.72	0.44
1:B:363:PHE:HB2	1:B:390:ARG:CZ	2.48	0.44
1:A:283:PRO:HG3	1:A:332:SER:CB	2.47	0.44
1:B:120:LEU:CD2	1:B:122:LEU:HD21	2.44	0.44
1:D:54:LEU:O	1:D:55:LEU:C	2.60	0.44
1:A:122:LEU:HD23	1:A:127:HIS:NE2	2.33	0.44
1:D:93:LEU:N	1:D:93:LEU:HD23	2.32	0.44
1:D:408:ILE:HD11	1:D:414:TYR:CE2	2.53	0.44
1:D:441:LEU:HB3	1:D:442:PRO:HD2	1.98	0.44
1:A:264:GLU:OE2	3:A:502:GUN:O6	2.35	0.44
1:B:165:LEU:HD23	1:B:165:LEU:HA	1.77	0.44
1:C:66:LEU:HD11	1:C:75:GLU:HB2	2.00	0.44
1:C:367:HIS:HE1	1:C:407:ALA:HB1	1.82	0.44
1:D:291:GLU:CD	1:D:291:GLU:H	2.17	0.44
1:D:242:LEU:HB3	1:D:267:TYR:CE2	2.53	0.43
1:D:0:ARG:HG3	1:D:2:ILE:HD11	2.01	0.43
1:D:48:THR:CG2	1:D:49:ASP:N	2.81	0.43
1:D:52:LYS:HG2	1:D:52:LYS:O	2.17	0.43
1:A:421:GLU:HG2	1:A:424:ARG:HH21	1.83	0.43
1:B:149:ASN:HA	1:B:333:MET:SD	2.58	0.43
1:B:432:GLY:O	1:B:436:GLN:HG3	2.18	0.43
1:A:214:MET:HE1	1:A:248:ILE:HD13	2.01	0.43
1:B:120:LEU:HG	1:B:122:LEU:HD23	2.01	0.43
1:B:241:ARG:CZ	3:B:502:GUN:HN22	2.31	0.43
1:A:77:ILE:O	1:A:78:ASN:HB2	2.19	0.43
1:A:286:LEU:N	1:A:286:LEU:HD23	2.33	0.43
1:A:452:ILE:CG2	1:A:453:CYS:N	2.82	0.43
1:C:48:THR:HG22	1:C:49:ASP:N	2.33	0.43
1:C:332:SER:HA	1:C:335:LEU:HD23	2.01	0.43
1:D:12:ASP:OD1	1:D:12:ASP:N	2.50	0.43
1:D:122:LEU:N	1:D:122:LEU:CD2	2.82	0.42
1:B:23:LYS:HE3	1:B:23:LYS:HB3	1.76	0.42
1:B:263:GLU:HG2	1:B:389:ARG:HG3	2.01	0.42
1:B:291:GLU:N	1:B:291:GLU:CD	2.76	0.42
1:C:70:ARG:HD3	1:C:70:ARG:HA	1.84	0.42
1:C:302:PHE:CE1	1:C:306:THR:HG21	2.54	0.42
1:D:7:PRO:HA	1:D:98:PHE:CZ	2.54	0.42
1:C:82:GLU:CD	1:C:82:GLU:N	2.76	0.42
1:C:192:ALA:N	1:C:193:PRO:HD2	2.34	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:7:PRO:HA	1:B:98:PHE:CE2	2.54	0.42
1:A:438:ARG:HD2	5:A:620:HOH:O	2.20	0.42
1:D:53:GLU:HG2	1:D:57:ARG:HD2	2.02	0.42
1:B:415:LYS:C	1:B:416:ILE:HD13	2.44	0.42
1:C:264:GLU:OE1	3:C:501:GUN:O6	2.36	0.42
1:C:373:LEU:CD2	1:C:387:ASP:OD1	2.66	0.42
1:A:241:ARG:NH1	3:A:502:GUN:N2	2.68	0.42
1:C:61:PHE:HA	1:C:77:ILE:O	2.20	0.42
1:D:2:ILE:CD1	1:D:77:ILE:HG13	2.49	0.42
1:A:111:ILE:HG22	1:A:112:HIS:CG	2.55	0.42
1:C:100:VAL:HG13	1:C:104:ILE:HG13	2.01	0.42
1:D:389:ARG:NH2	5:D:606:HOH:O	2.53	0.41
1:D:265:LEU:HD23	1:D:299:LEU:HD11	2.02	0.41
1:A:108:TYR:CD1	1:A:108:TYR:C	2.98	0.41
1:D:304:VAL:HG13	1:D:309:GLU:CA	2.49	0.41
1:A:142:LEU:HB3	1:A:348:SER:OG	2.19	0.41
1:B:185:CYS:SG	1:B:225:PRO:HB3	2.60	0.41
1:C:235:MET:HE3	1:C:244:ALA:CB	2.50	0.41
1:A:269:LEU:HD23	1:A:269:LEU:HA	1.71	0.41
1:B:61:PHE:HA	1:B:77:ILE:O	2.21	0.41
1:B:204:GLN:O	1:D:91:ARG:NH1	2.53	0.41
1:B:331:LYS:O	1:B:334:PRO:HD2	2.21	0.41
1:C:370:MET:HG3	1:C:414:TYR:CG	2.56	0.41
1:A:122:LEU:HD12	1:A:122:LEU:HA	1.73	0.41
1:C:72:VAL:CG1	1:C:73:LYS:N	2.84	0.41
1:D:125:SER:HB2	1:D:360:GLN:OE1	2.20	0.41
1:D:165:LEU:O	1:D:169:ARG:HG3	2.21	0.41
1:D:434:VAL:HG22	1:D:439:MET:HG3	2.03	0.41
1:A:191:GLU:OE2	1:A:227:PRO:HD2	2.21	0.41
1:B:191:GLU:OE2	1:B:227:PRO:HD2	2.19	0.41
1:A:43:ASN:ND2	5:A:605:HOH:O	2.53	0.41
1:A:214:MET:HE1	1:A:248:ILE:CD1	2.51	0.41
1:A:226:ASN:HB2	1:A:227:PRO:HD2	2.03	0.41
1:C:7:PRO:HA	1:C:98:PHE:CE2	2.56	0.41
1:D:416:ILE:HD12	1:D:452:ILE:HD11	2.01	0.41
1:A:111:ILE:O	1:A:112:HIS:HB2	2.21	0.41
1:C:152:VAL:CG2	1:C:249:ALA:HB2	2.50	0.40
1:C:416:ILE:H	1:C:416:ILE:HG13	1.71	0.40
1:A:259:VAL:HG23	1:A:433:PHE:CE2	2.56	0.40
1:A:333:MET:HB2	1:A:334:PRO:HD3	2.02	0.40
1:C:408:ILE:HA	1:C:412:GLY:O	2.22	0.40

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:83:ALA:HB1	1:D:93:LEU:HD12	2.04	0.40
1:A:111:ILE:HG22	1:A:112:HIS:NE2	2.36	0.40
1:C:374:LYS:C	1:C:375:LEU:HD23	2.46	0.40
1:D:103:ASP:O	1:D:107:VAL:HB	2.22	0.40
1:A:416:ILE:CD1	1:A:450:TYR:CB	3.00	0.40
1:B:336:VAL:O	1:B:340:ARG:HG2	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:D:-3:PRO:CD	2:C:502:O02:O1A[7_645]	1.37	0.83
1:A:67:ARG:NH1	1:A:278:LYS:CD[3_444]	1.97	0.23

## 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	452/459 (98%)	429 (95%)	20 (4%)	3 (1%)	19	20
1	B	452/459 (98%)	432 (96%)	19 (4%)	1 (0%)	44	52
1	C	438/459 (95%)	417 (95%)	20 (5%)	1 (0%)	44	52
1	D	444/459 (97%)	420 (95%)	19 (4%)	5 (1%)	12	11
All	All	1786/1836 (97%)	1698 (95%)	78 (4%)	10 (1%)	22	24

All (10) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	149	ASN
1	D	54	LEU
1	D	55	LEU

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Mol	Chain	Res	Type
1	D	444	SER
1	D	28	SER
1	A	49	ASP
1	B	149	ASN
1	D	51	SER
1	A	187	PRO
1	A	400	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	386/390 (99%)	379 (98%)	7 (2%)	54	67
1	B	385/390 (99%)	381 (99%)	4 (1%)	73	84
1	C	378/390 (97%)	370 (98%)	8 (2%)	48	61
1	D	379/390 (97%)	365 (96%)	14 (4%)	29	38
All	All	1528/1560 (98%)	1495 (98%)	33 (2%)	47	59

All (33) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	6	SER
1	A	59	GLU
1	A	158	SER
1	A	185	CYS
1	A	286	LEU
1	A	441	LEU
1	A	447	ILE
1	B	38	SER
1	B	46	SER
1	B	114	THR
1	B	441	LEU
1	C	41	VAL
1	C	47	LEU
1	C	185	CYS

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Mol	Chain	Res	Type
1	C	286	LEU
1	C	393	SER
1	C	399	ASN
1	C	430	LEU
1	C	450	TYR
1	D	27	SER
1	D	41	VAL
1	D	46	SER
1	D	47	LEU
1	D	56	SER
1	D	111	ILE
1	D	125	SER
1	D	144	VAL
1	D	149	ASN
1	D	185	CYS
1	D	218	SER
1	D	220	ILE
1	D	259	VAL
1	D	453	CYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (25) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	43	ASN
1	A	110	GLN
1	A	113	ASN
1	A	124	ASN
1	A	138	ASN
1	A	162	ASN
1	A	339	ASN
1	A	417	ASN
1	A	431	GLN
1	B	64	ASN
1	B	112	HIS
1	B	157	HIS
1	B	203	GLN
1	B	314	HIS
1	B	339	ASN
1	B	417	ASN
1	C	138	ASN
1	C	149	ASN
1	C	399	ASN

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Mol	Chain	Res	Type
1	C	431	GLN
1	D	314	HIS
1	D	372	ASN
1	D	379	GLN
1	D	417	ASN
1	D	431	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](#)

7 ligands are modelled in this entry.

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
2	0O2	C	502	-	32,42,42	3.52	14 (43%)	44,68,68	1.72	15 (34%)
3	GUN	B	502	-	7,12,12	6.49	7 (100%)	8,17,17	3.31	5 (62%)
4	HSX	D	501	-	14,14,14	6.77	5 (35%)	20,21,21	1.27	1 (5%)
2	0O2	B	501	-	32,42,42	3.53	13 (40%)	44,68,68	1.80	12 (27%)
2	0O2	A	501	-	32,42,42	3.56	12 (37%)	44,68,68	1.83	14 (31%)
3	GUN	A	502	-	7,12,12	6.33	7 (100%)	8,17,17	3.48	6 (75%)
3	GUN	C	501	-	7,12,12	6.71	7 (100%)	8,17,17	3.35	7 (87%)



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
2	0O2	C	502	-	-	8/29/49/49	0/3/3/3
3	GUN	B	502	-	-	-	0/2/2/2
4	HSX	D	501	-	-	4/6/22/22	0/1/1/1
2	0O2	B	501	-	-	5/29/49/49	0/3/3/3
2	0O2	A	501	-	-	10/29/49/49	0/3/3/3
3	GUN	A	502	-	-	-	0/2/2/2
3	GUN	C	501	-	-	-	0/2/2/2

All (65) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	D	501	HSX	C1-C2	-18.33	1.31	1.52
2	A	501	0O2	O4'-C1'	12.77	1.58	1.41
2	B	501	0O2	O4'-C1'	12.64	1.58	1.41
2	C	502	0O2	O4'-C1'	12.37	1.58	1.41
4	D	501	HSX	O4-C1	10.45	1.55	1.43
3	C	501	GUN	C2-N1	10.37	1.63	1.37
3	B	502	GUN	C2-N1	10.10	1.62	1.37
4	D	501	HSX	C3-C4	-10.05	1.27	1.53
3	A	502	GUN	C2-N1	9.98	1.62	1.37
2	C	502	0O2	O6-C6	8.28	1.40	1.23
3	C	501	GUN	C6-N1	8.26	1.50	1.37
2	A	501	0O2	O6-C6	8.18	1.39	1.23
3	B	502	GUN	C6-N1	8.08	1.49	1.37
2	B	501	0O2	O6-C6	7.98	1.39	1.23
3	B	502	GUN	O6-C6	7.86	1.39	1.23
3	C	501	GUN	O6-C6	7.55	1.38	1.23
3	A	502	GUN	O6-C6	7.49	1.38	1.23
3	A	502	GUN	C6-N1	7.28	1.48	1.37
4	D	501	HSX	O4-C4	6.51	1.59	1.45
4	D	501	HSX	C3-C2	6.21	1.70	1.53
3	C	501	GUN	C2-N2	5.31	1.46	1.34
2	C	502	0O2	C2'-C1'	-5.25	1.45	1.53
2	A	501	0O2	C2'-C1'	-5.16	1.45	1.53
3	C	501	GUN	C5-C6	-5.13	1.37	1.47
2	B	501	0O2	C2'-C1'	-5.12	1.46	1.53
3	A	502	GUN	C2-N2	5.10	1.46	1.34
2	C	502	0O2	C2-N2	4.88	1.45	1.34

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	501	0O2	C2-N2	4.81	1.45	1.34
2	B	501	0O2	C2-N2	4.68	1.45	1.34
3	B	502	GUN	C2-N2	4.64	1.45	1.34
3	C	501	GUN	C2-N3	4.60	1.44	1.33
3	A	502	GUN	C2-N3	4.57	1.44	1.33
2	B	501	0O2	C2-N1	4.47	1.48	1.37
3	B	502	GUN	C2-N3	4.46	1.44	1.33
2	A	501	0O2	O4'-C4'	4.33	1.54	1.45
2	C	502	0O2	C2-N1	4.33	1.48	1.37
3	B	502	GUN	C5-C6	-4.24	1.38	1.47
3	A	502	GUN	C5-C6	-4.23	1.38	1.47
2	B	501	0O2	O4'-C4'	4.21	1.54	1.45
2	C	502	0O2	C2-N3	4.13	1.43	1.33
2	C	502	0O2	O4'-C4'	3.96	1.53	1.45
2	A	501	0O2	C2-N3	3.95	1.42	1.33
2	A	501	0O2	C2-N1	3.94	1.47	1.37
2	B	501	0O2	C2-N3	3.68	1.42	1.33
2	A	501	0O2	PC-O3'	3.67	1.70	1.60
2	B	501	0O2	C2'-C3'	-3.42	1.45	1.52
2	B	501	0O2	PC-O3'	3.22	1.69	1.60
2	C	502	0O2	C2'-C3'	-3.13	1.46	1.52
2	A	501	0O2	C2'-C3'	-2.99	1.46	1.52
2	C	502	0O2	C8-N7	2.81	1.39	1.35
2	C	502	0O2	PC-O3'	2.74	1.67	1.60
2	B	501	0O2	C8-N7	2.67	1.39	1.35
3	A	502	GUN	C4-N3	-2.60	1.26	1.38
3	C	501	GUN	C4-N3	-2.58	1.26	1.38
3	B	502	GUN	C4-N3	-2.57	1.26	1.38
2	C	502	0O2	PG-O3G	-2.38	1.45	1.54
2	A	501	0O2	C8-N7	2.34	1.39	1.35
2	C	502	0O2	PG-O2G	-2.27	1.46	1.54
2	B	501	0O2	PG-O3G	-2.26	1.46	1.54
2	C	502	0O2	PD-O3D	-2.26	1.46	1.54
2	A	501	0O2	PG-O2G	-2.21	1.46	1.54
2	B	501	0O2	C5-C6	-2.08	1.43	1.47
2	B	501	0O2	PD-O3D	-2.07	1.46	1.54
2	A	501	0O2	PD-O3D	-2.06	1.46	1.54
2	C	502	0O2	PD-O1D	-2.00	1.47	1.54

All (60) bond angle outliers are listed below:

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	C	501	GUN	C2-N1-C6	-5.37	115.20	125.10
3	A	502	GUN	C2-N1-C6	-5.36	115.23	125.10
3	B	502	GUN	C2-N1-C6	-5.22	115.48	125.10
3	B	502	GUN	C8-N7-C5	4.83	112.20	102.99
3	A	502	GUN	C8-N7-C5	4.71	111.97	102.99
4	D	501	HSX	C1-C2-C3	4.71	108.19	102.30
3	C	501	GUN	N1-C2-N3	-4.40	115.10	123.32
3	C	501	GUN	C8-N7-C5	4.17	110.93	102.99
3	A	502	GUN	N1-C2-N3	-4.16	115.55	123.32
3	B	502	GUN	N1-C2-N3	-4.14	115.58	123.32
2	B	501	002	PA-O3A-PB	-3.75	119.94	132.83
2	B	501	002	O2G-PG-O3B	3.71	117.08	104.64
2	C	502	002	O3G-PG-O3B	3.55	116.53	104.64
2	A	501	002	PB-O3B-PG	-3.47	120.92	132.83
2	B	501	002	PB-O3B-PG	-3.25	121.68	132.83
2	B	501	002	PC-O3C-PD	-3.23	121.75	132.83
3	B	502	GUN	N2-C2-N3	3.17	125.91	119.74
3	A	502	GUN	N2-C2-N3	3.14	125.85	119.74
2	C	502	002	C5-C6-N1	3.14	119.49	113.95
2	A	501	002	O3D-PD-O3C	3.14	115.15	104.64
3	A	502	GUN	O6-C6-N1	-3.12	116.97	120.65
2	B	501	002	C2-N1-C6	-3.08	119.44	125.10
2	A	501	002	C2-N1-C6	-3.07	119.45	125.10
2	A	501	002	C5-C6-N1	3.04	119.32	113.95
2	A	501	002	PA-O3A-PB	-3.01	122.48	132.83
2	C	502	002	C2-N1-C6	-2.99	119.58	125.10
2	A	501	002	O3C-PC-O3'	2.99	108.51	102.48
2	C	502	002	O1D-PD-O3C	2.92	114.42	104.64
3	A	502	GUN	C5-C6-N1	2.91	119.08	113.95
2	B	501	002	O6-C6-C5	-2.89	118.73	124.37
2	B	501	002	O1D-PD-O3C	2.79	114.00	104.64
2	C	502	002	O4'-C1'-C2'	-2.75	102.91	106.93
3	C	501	GUN	C5-C6-N1	2.74	118.79	113.95
2	A	501	002	O2G-PG-O3B	2.73	113.78	104.64
2	A	501	002	O1C-PC-O2C	-2.72	98.78	112.24
2	A	501	002	O1D-PD-O3C	2.71	113.73	104.64
2	C	502	002	O2G-PG-O3B	2.70	113.70	104.64
2	B	501	002	C5-C6-N1	2.67	118.66	113.95
2	A	501	002	PC-O3C-PD	-2.64	123.77	132.83
3	C	501	GUN	O6-C6-C5	-2.63	119.23	124.37
2	B	501	002	O3D-PD-O3C	2.62	113.43	104.64

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	502	002	O3D-PD-O3C	2.62	113.41	104.64
2	B	501	002	O3C-PC-O3'	2.61	107.74	102.48
2	A	501	002	O3G-PG-O3B	2.52	113.10	104.64
3	B	502	GUN	C5-C6-N1	2.49	118.35	113.95
2	A	501	002	N1-C2-N3	-2.42	118.79	123.32
2	C	502	002	N1-C2-N3	-2.38	118.87	123.32
2	A	501	002	O6-C6-C5	-2.35	119.79	124.37
2	B	501	002	C2'-C3'-C4'	2.31	107.33	103.22
2	C	502	002	PA-O3A-PB	-2.29	124.96	132.83
2	B	501	002	O1C-PC-O2C	-2.28	100.98	112.24
2	C	502	002	O6-C6-C5	-2.22	120.04	124.37
2	C	502	002	O3C-PC-O3'	2.20	106.92	102.48
2	C	502	002	PC-O3C-PD	-2.20	125.27	132.83
2	A	501	002	O1A-PA-O2A	-2.19	101.42	112.24
2	C	502	002	O1B-PB-O2B	-2.16	101.54	112.24
3	C	501	GUN	N2-C2-N3	2.12	123.87	119.74
2	C	502	002	C2'-C3'-C4'	2.11	106.96	103.22
2	C	502	002	O1C-PC-O2C	-2.07	102.01	112.24
3	C	501	GUN	N2-C2-N1	2.02	121.01	116.71

There are no chirality outliers.

All (27) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	501	002	C5'-O5'-PA-O3A
2	A	501	002	C5'-O5'-PA-O2A
2	C	502	002	PC-O3C-PD-O3D
2	C	502	002	C5'-O5'-PA-O3A
2	C	502	002	O4'-C4'-C5'-O5'
4	D	501	HSX	C5-O5-P'-O1X
4	D	501	HSX	C5-O5-P'-O2X
4	D	501	HSX	C5-O5-P'-O3X
2	A	501	002	O4'-C4'-C5'-O5'
2	C	502	002	C3'-C4'-C5'-O5'
2	A	501	002	C3'-C4'-C5'-O5'
2	A	501	002	C4'-C5'-O5'-PA
2	A	501	002	PB-O3A-PA-O5'
2	A	501	002	PD-O3C-PC-O3'
2	B	501	002	PB-O3A-PA-O5'
2	B	501	002	PD-O3C-PC-O3'
2	B	501	002	C4'-C5'-O5'-PA
2	C	502	002	PA-O3A-PB-O1B

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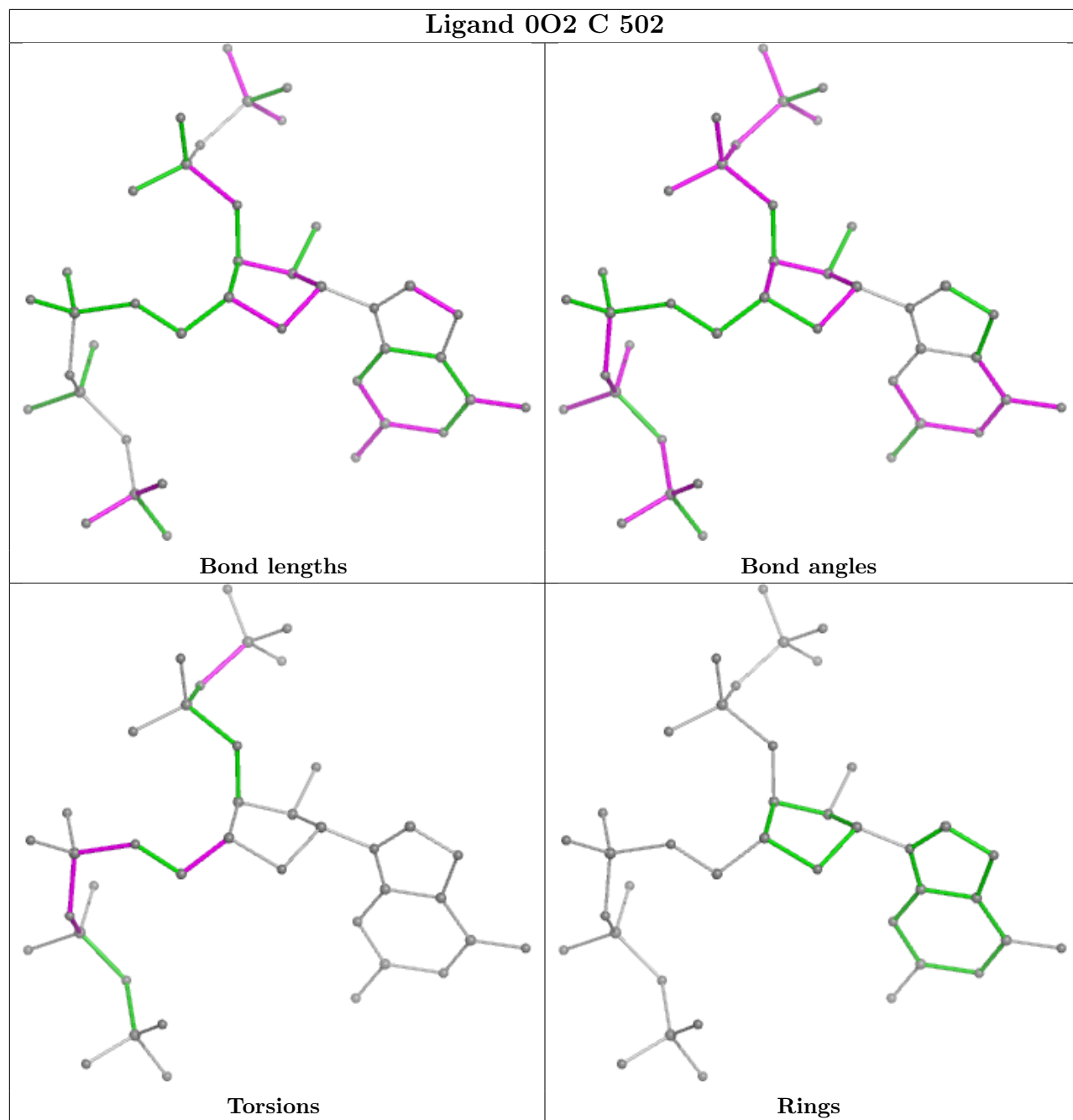
Mol	Chain	Res	Type	Atoms
2	C	502	0O2	C5'-O5'-PA-O2A
2	A	501	0O2	PA-O3A-PB-O3B
4	D	501	HSX	C3-C4-C5-O5
2	A	501	0O2	PB-O3B-PG-O1G
2	B	501	0O2	O4'-C4'-C5'-O5'
2	A	501	0O2	PA-O3A-PB-O1B
2	C	502	0O2	PA-O3A-PB-O2B
2	C	502	0O2	PB-O3A-PA-O1A
2	B	501	0O2	C5'-O5'-PA-O2A

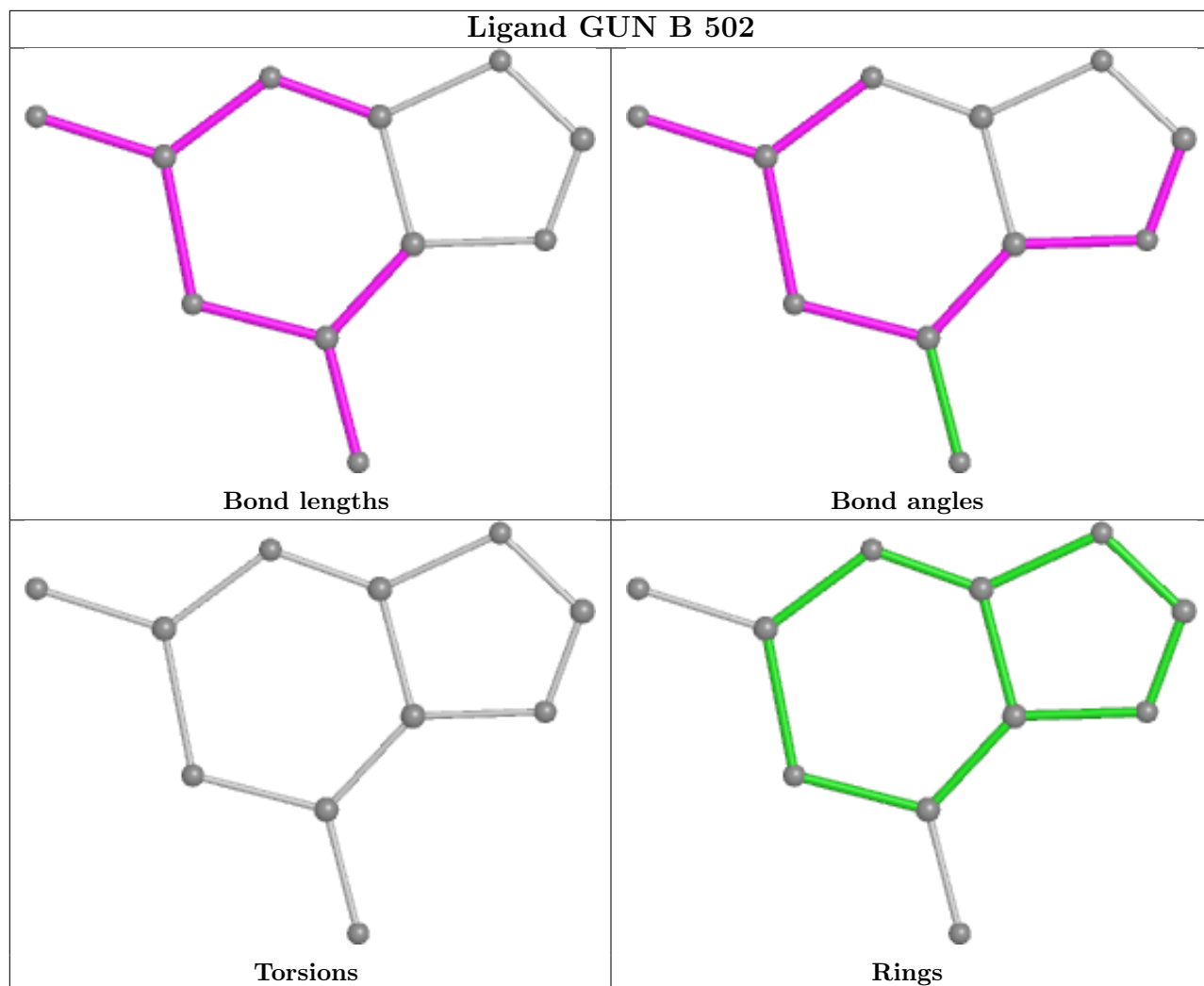
There are no ring outliers.

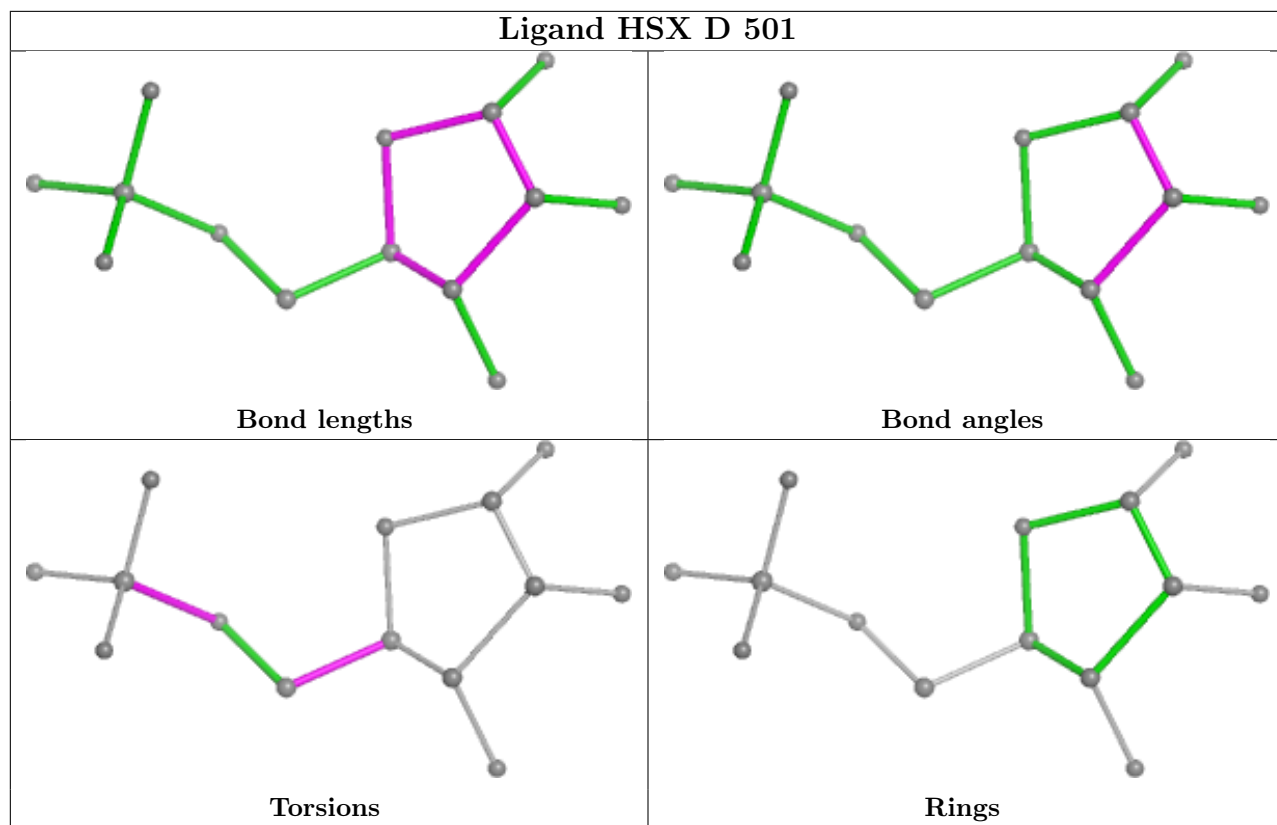
6 monomers are involved in 22 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	C	502	0O2	0	1
3	B	502	GUN	4	0
2	B	501	0O2	2	0
2	A	501	0O2	3	0
3	A	502	GUN	7	0
3	C	501	GUN	5	0

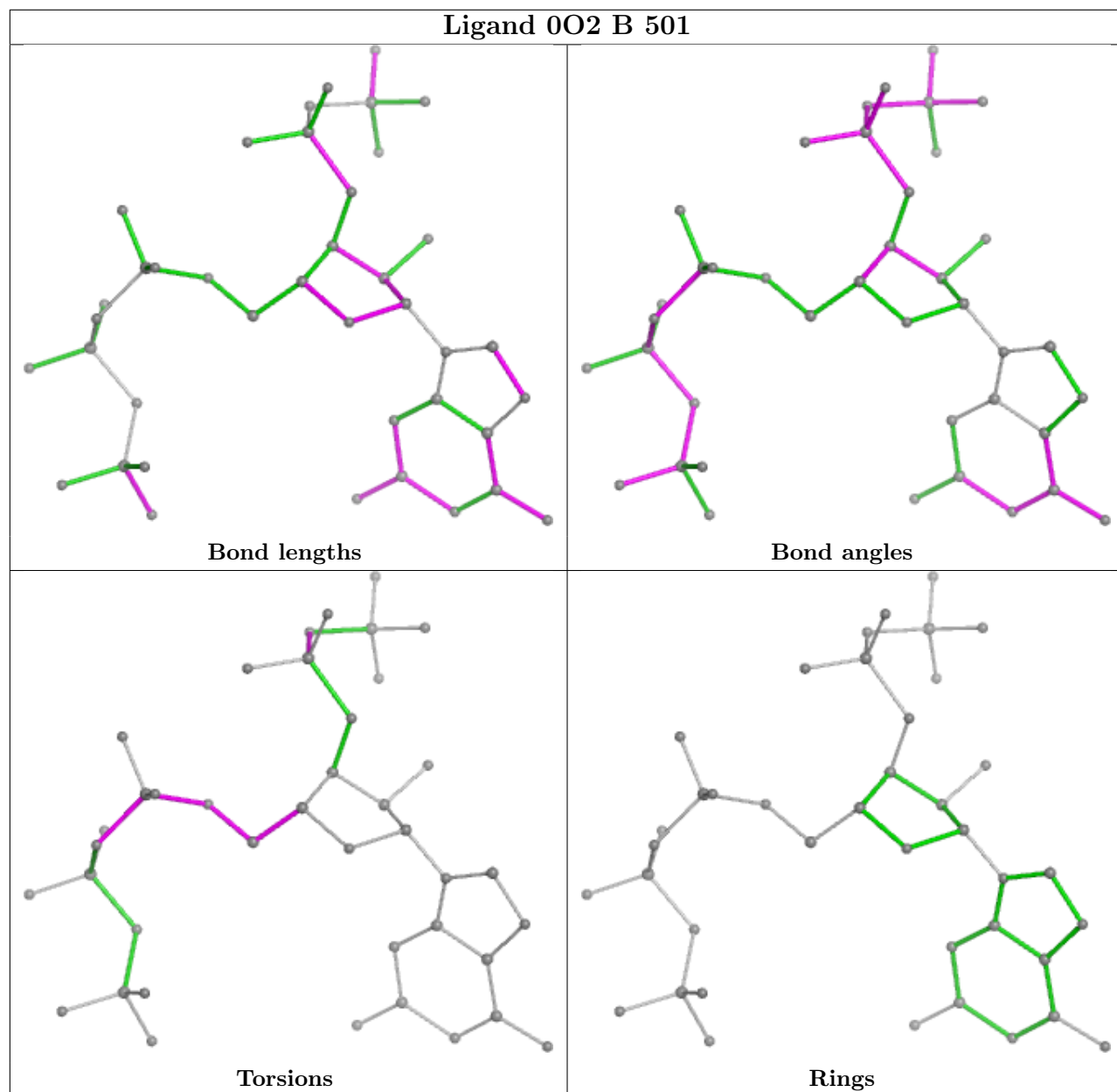
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. 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.

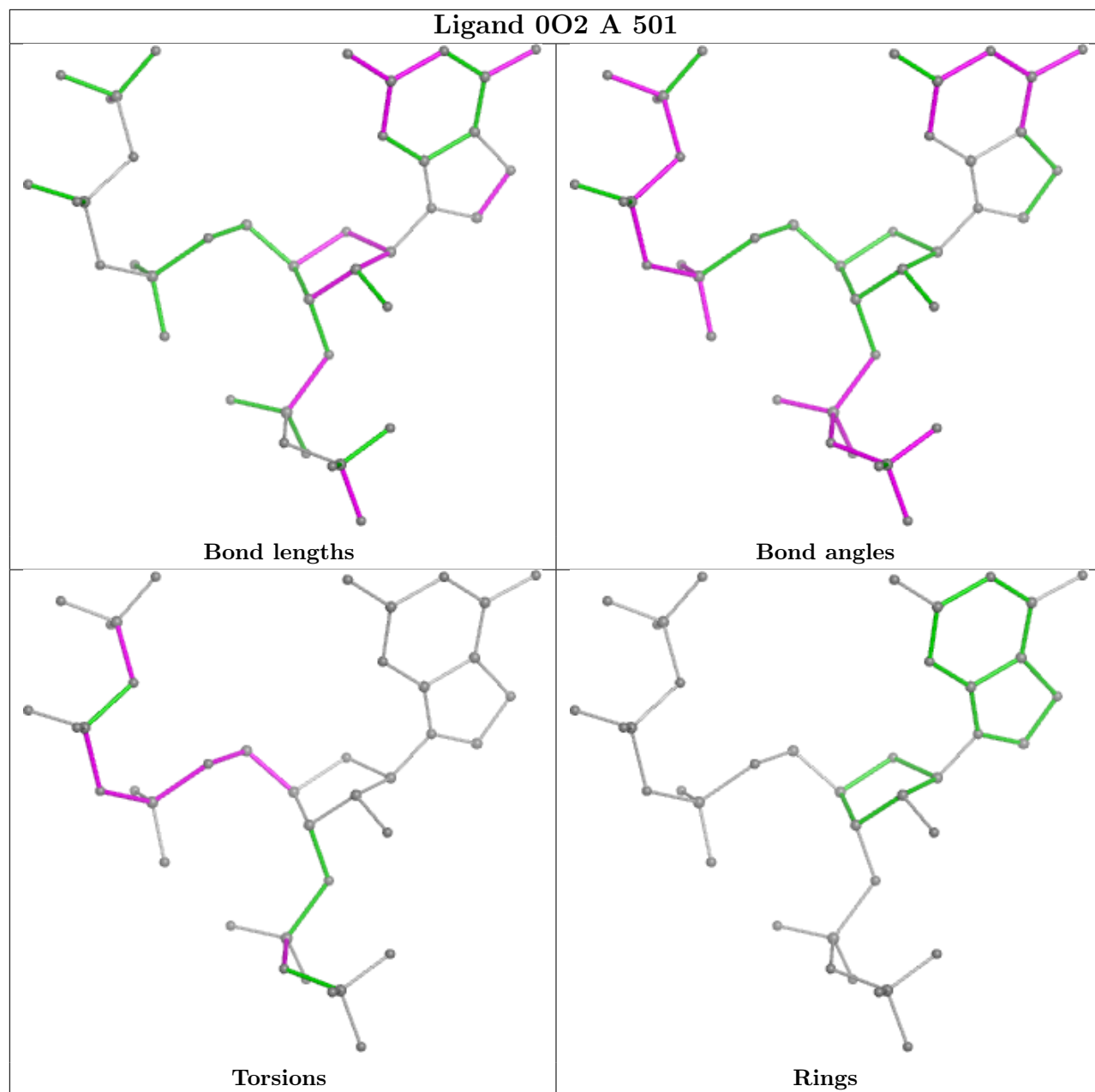


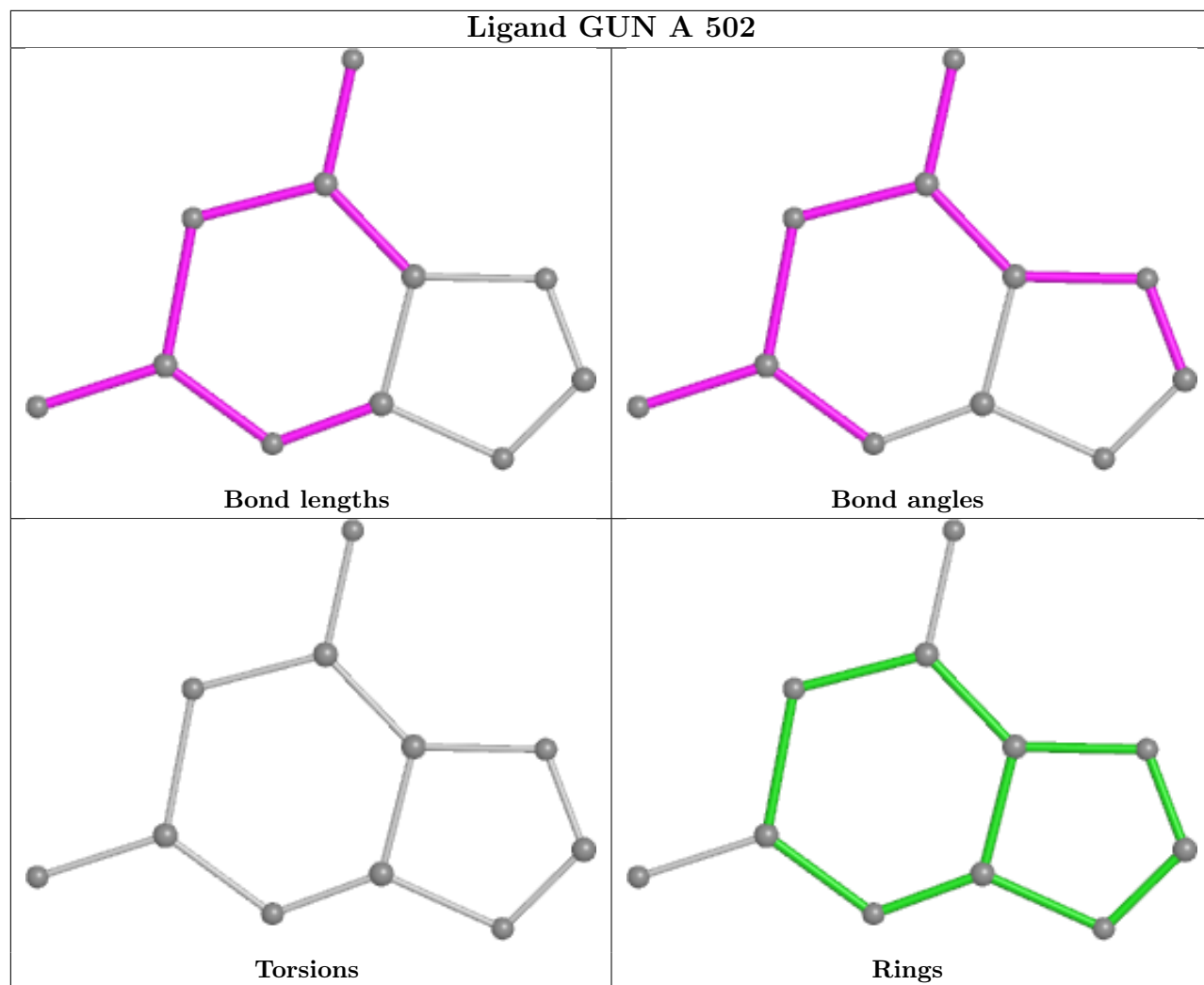


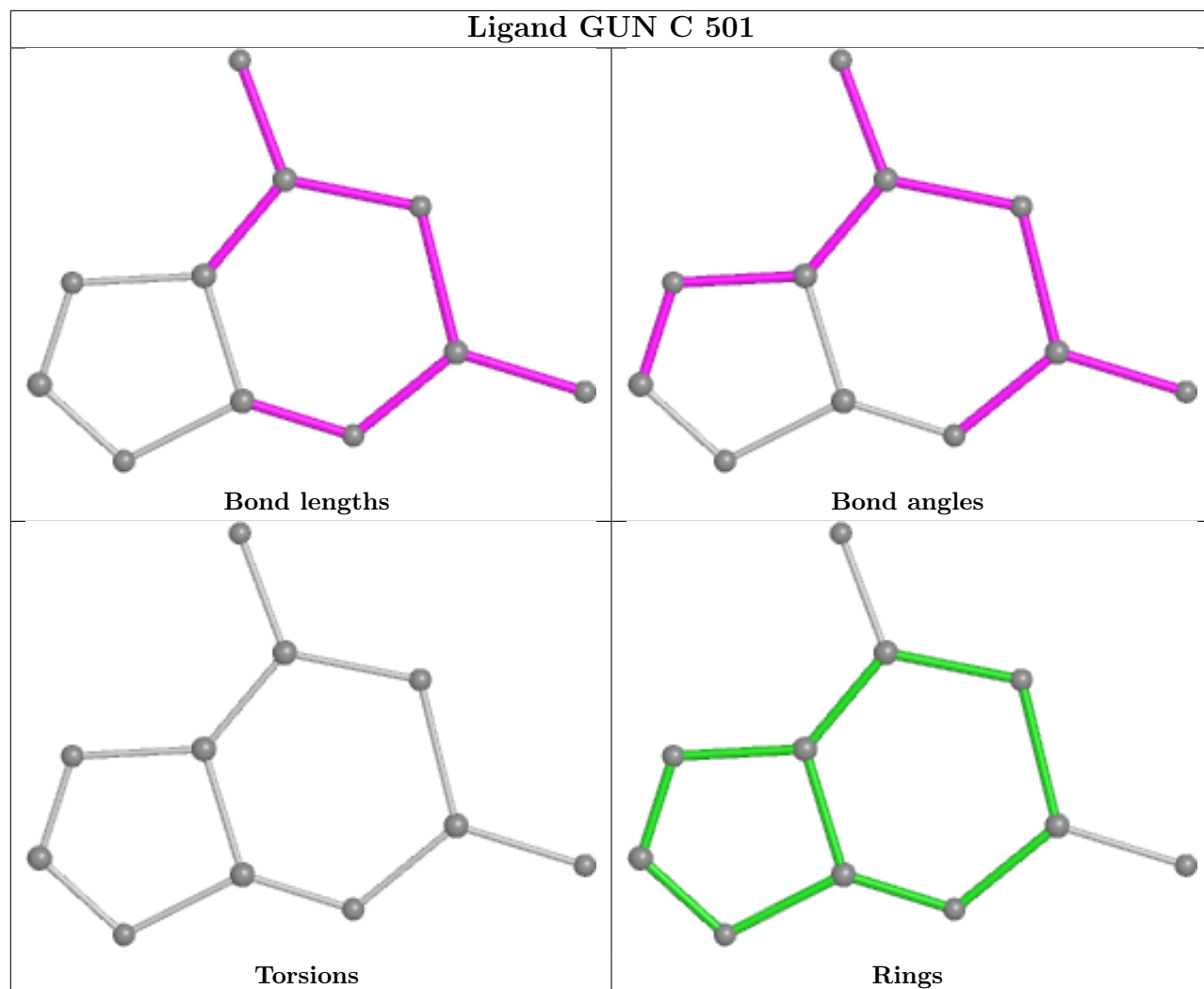












## 5.7 Other polymers [i](#)

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	A	454/459 (98%)	0.13	30 (6%) 26 29	43, 56, 102, 120	10 (2%)
1	B	454/459 (98%)	0.00	14 (3%) 51 57	43, 56, 92, 123	8 (1%)
1	C	444/459 (96%)	0.23	28 (6%) 27 32	45, 60, 112, 130	8 (1%)
1	D	448/459 (97%)	0.06	15 (3%) 49 55	44, 57, 87, 115	6 (1%)
All	All	1800/1836 (98%)	0.10	87 (4%) 36 43	43, 57, 102, 130	32 (1%)

All (87) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	441	LEU	5.2
1	D	55	LEU	5.0
1	A	447	ILE	5.0
1	C	452	ILE	5.0
1	B	445	ALA	4.8
1	B	454	THR	4.7
1	C	47	LEU	4.5
1	C	118	PRO	4.4
1	D	445	ALA	4.4
1	C	441	LEU	4.3
1	D	453	CYS	4.2
1	D	47	LEU	4.2
1	A	445	ALA	4.1
1	C	447	ILE	4.1
1	B	47	LEU	4.1
1	A	452	ILE	4.0
1	D	111	ILE	4.0
1	C	450	TYR	3.9
1	B	441	LEU	3.9
1	C	411	PHE	3.8
1	A	403	VAL	3.7

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>	<b>RSRZ</b>
1	D	108	TYR	3.6
1	B	442	PRO	3.5
1	C	405	ILE	3.4
1	A	442	PRO	3.4
1	C	416	ILE	3.3
1	B	447	ILE	3.3
1	A	115	VAL	3.3
1	C	448	PRO	3.2
1	D	442	PRO	3.2
1	C	403	VAL	3.2
1	B	448	PRO	3.2
1	A	111	ILE	3.2
1	A	47	LEU	3.1
1	C	112	HIS	3.0
1	A	441	LEU	3.0
1	C	122	LEU	3.0
1	B	452	ILE	2.9
1	C	398	GLY	2.9
1	A	114	THR	2.8
1	D	51	SER	2.8
1	A	444	SER	2.7
1	C	408	ILE	2.7
1	A	392	PHE	2.6
1	B	54	LEU	2.6
1	C	54	LEU	2.6
1	C	395	ILE	2.6
1	B	51	SER	2.6
1	A	450	TYR	2.6
1	D	443	GLY	2.6
1	A	446	TYR	2.6
1	C	440	LYS	2.5
1	A	116	ARG	2.5
1	A	122	LEU	2.5
1	C	415	LYS	2.5
1	C	407	ALA	2.5
1	C	1	ALA	2.4
1	B	453	CYS	2.4
1	D	53	GLU	2.4
1	A	278	LYS	2.3
1	C	0	ARG	2.3
1	C	397	ALA	2.3
1	D	49	ASP	2.3

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Mol	Chain	Res	Type	RSRZ
1	A	453	CYS	2.3
1	C	392	PHE	2.3
1	A	443	GLY	2.3
1	C	446	TYR	2.3
1	A	411	PHE	2.3
1	A	51	SER	2.3
1	D	444	SER	2.3
1	D	109	GLY	2.3
1	D	-3	PRO	2.2
1	A	451	GLU	2.2
1	A	113	ASN	2.2
1	B	48	THR	2.2
1	A	123	ASP	2.2
1	A	50	ASN	2.1
1	C	412	GLY	2.1
1	B	420	LYS	2.1
1	A	414	TYR	2.0
1	A	112	HIS	2.0
1	A	415	LYS	2.0
1	A	416	ILE	2.0
1	C	24	ARG	2.0
1	C	418	GLY	2.0
1	A	440	LYS	2.0
1	B	46	SER	2.0

## 6.2 Non-standard residues in protein, DNA, RNA chains [i](#)

There are no non-standard protein/DNA/RNA residues in this entry.

## 6.3 Carbohydrates [i](#)

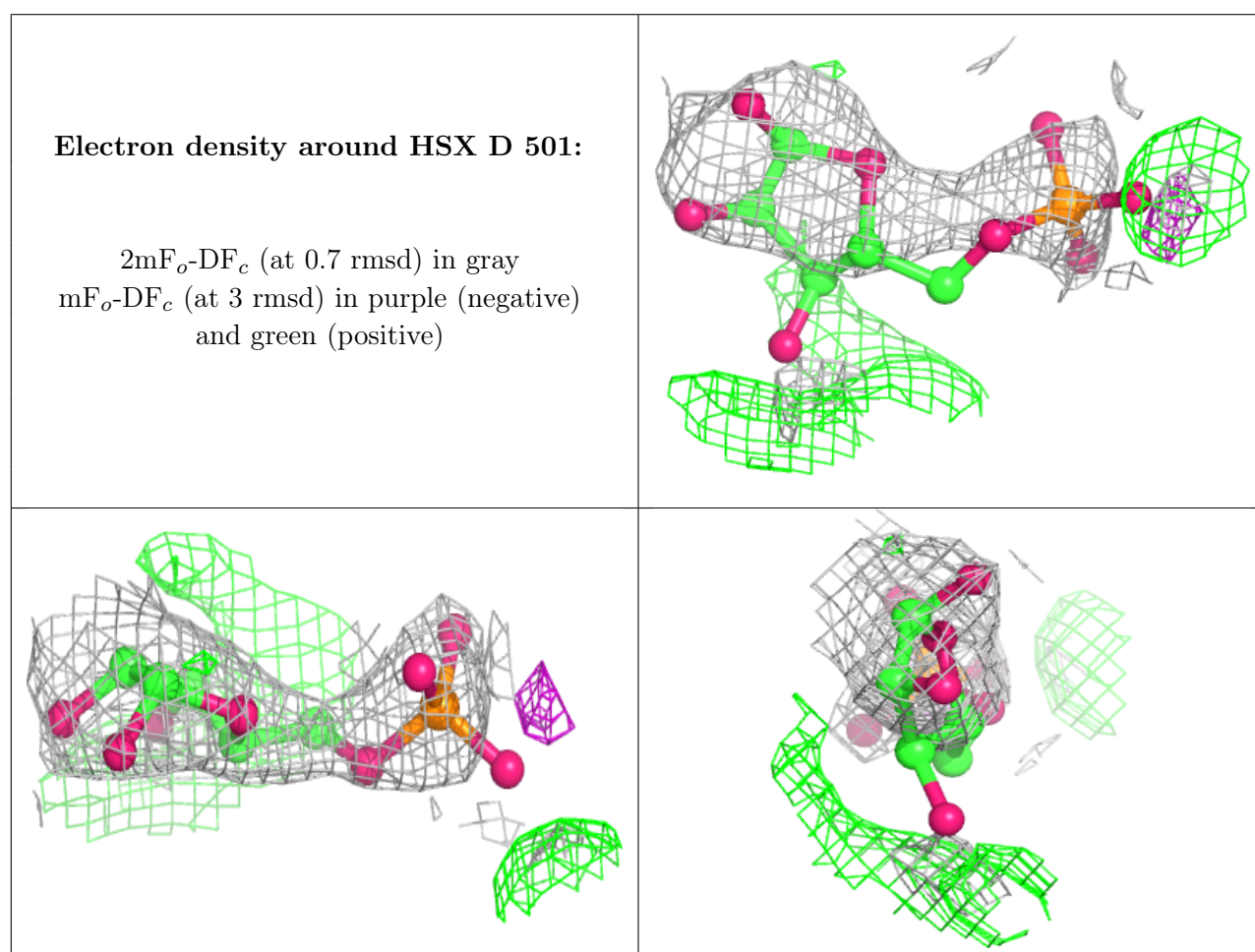
There are no oligosaccharides in this entry.

## 6.4 Ligands [i](#)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 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( $\text{\AA}^2$ )	Q<0.9
4	HSX	D	501	14/14	0.68	0.21	60,73,80,167	14
3	GUN	C	501	11/11	0.76	0.28	57,64,77,79	16
3	GUN	A	502	11/11	0.77	0.35	58,60,77,77	16
2	0O2	C	502	40/40	0.81	0.13	66,85,103,106	24
2	0O2	B	501	40/40	0.88	0.09	53,77,111,128	0
3	GUN	B	502	11/11	0.88	0.16	58,65,80,82	7
2	0O2	A	501	40/40	0.89	0.10	46,82,110,118	51

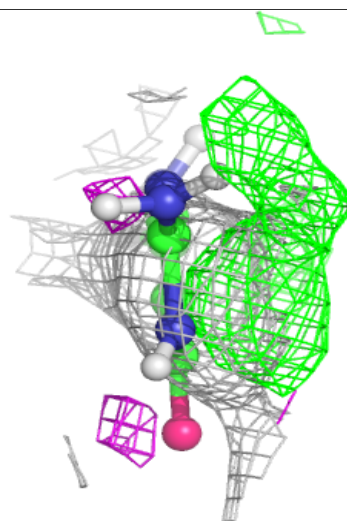
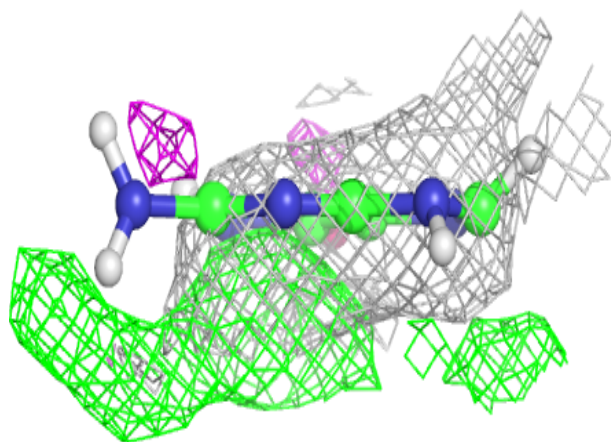
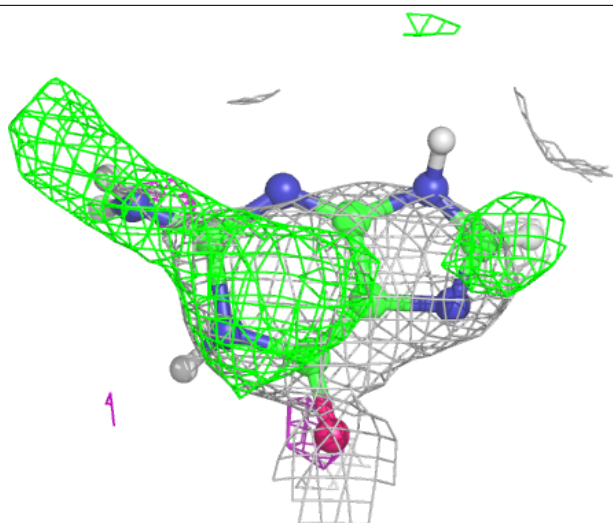
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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





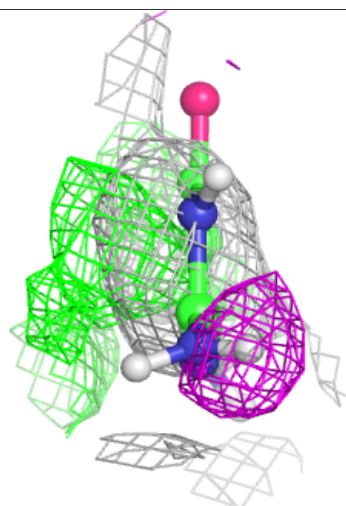
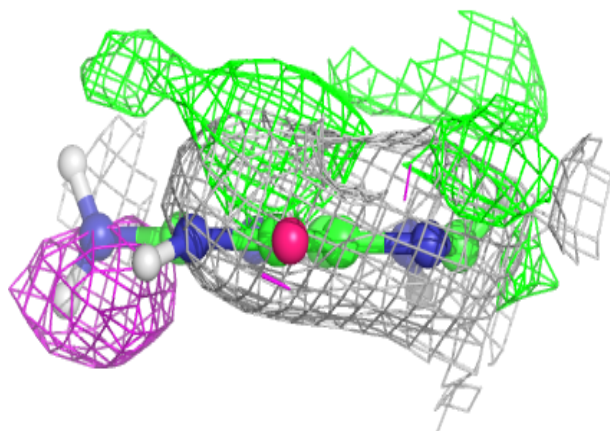
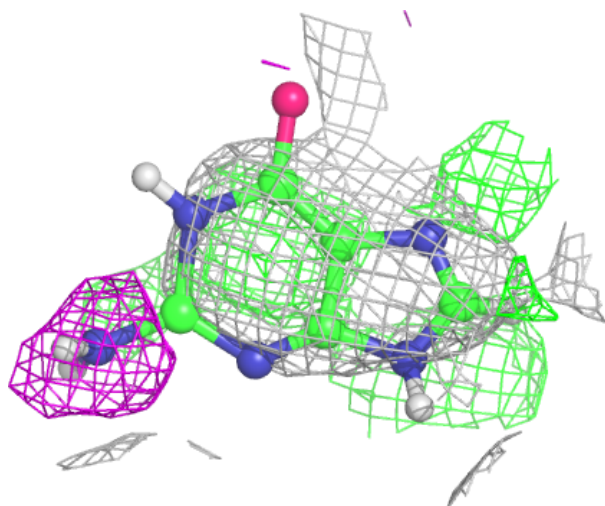
**Electron density around GUN C 501:**

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



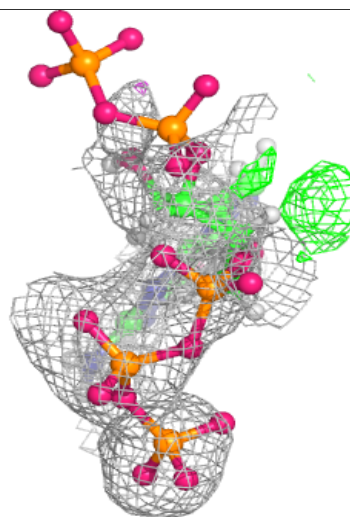
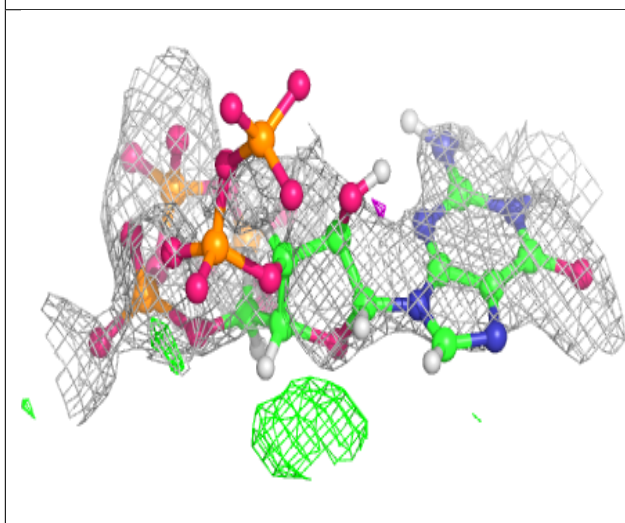
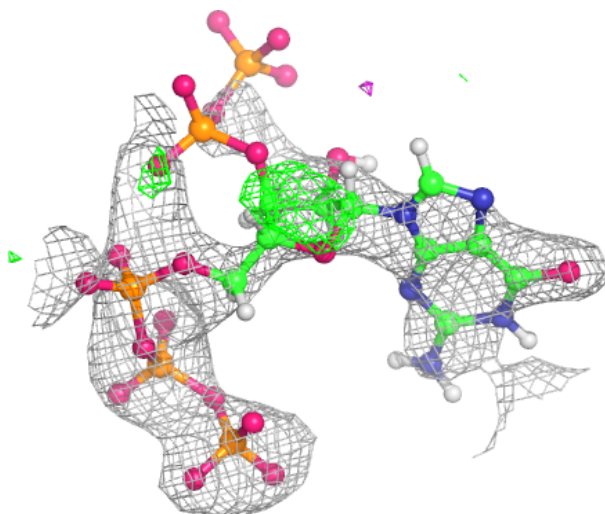
**Electron density around GUN A 502:**

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



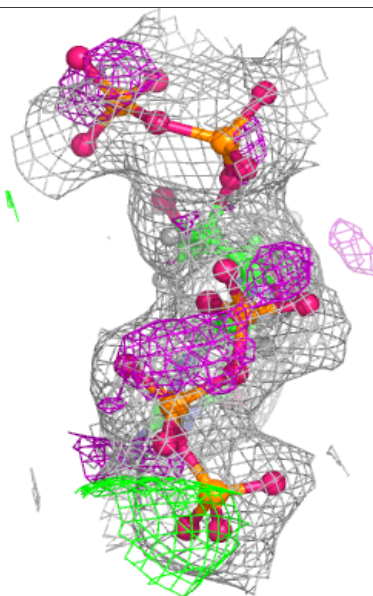
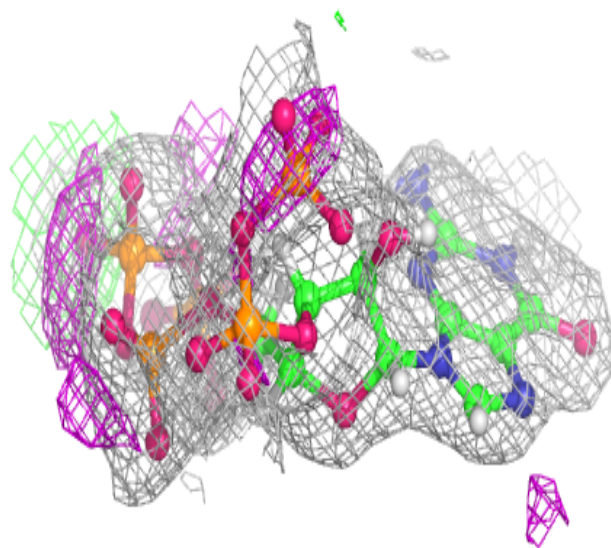
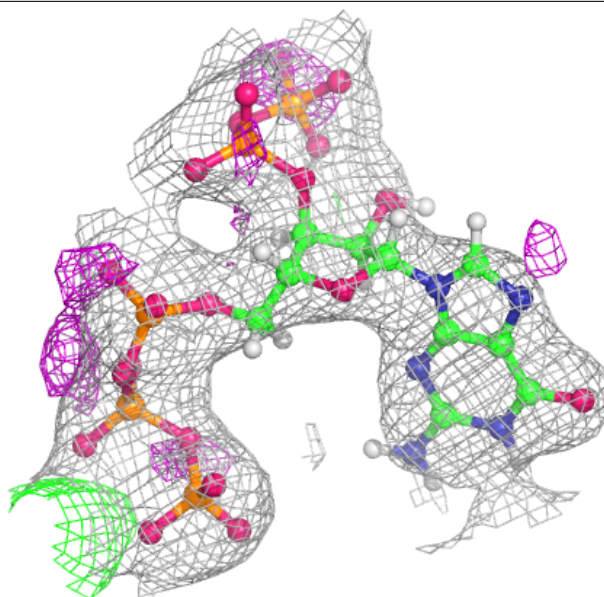
**Electron density around 0O2 C 502:**

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



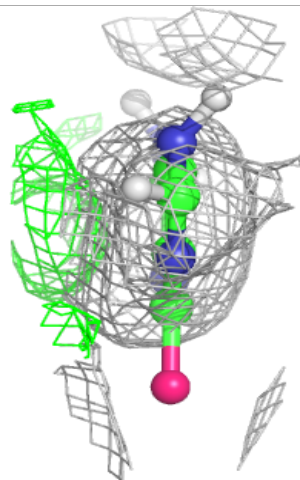
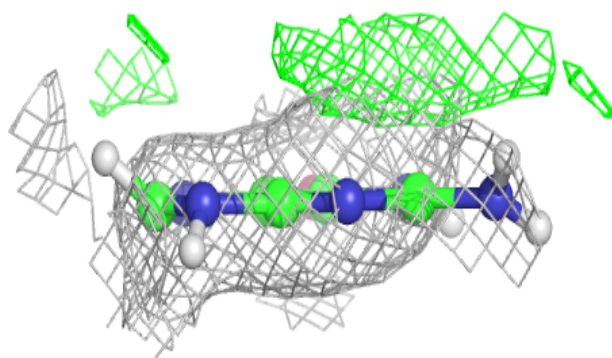
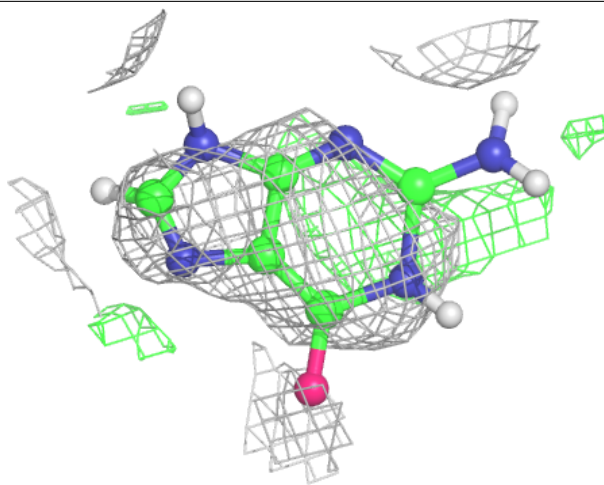
**Electron density around 0O2 B 501:**

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

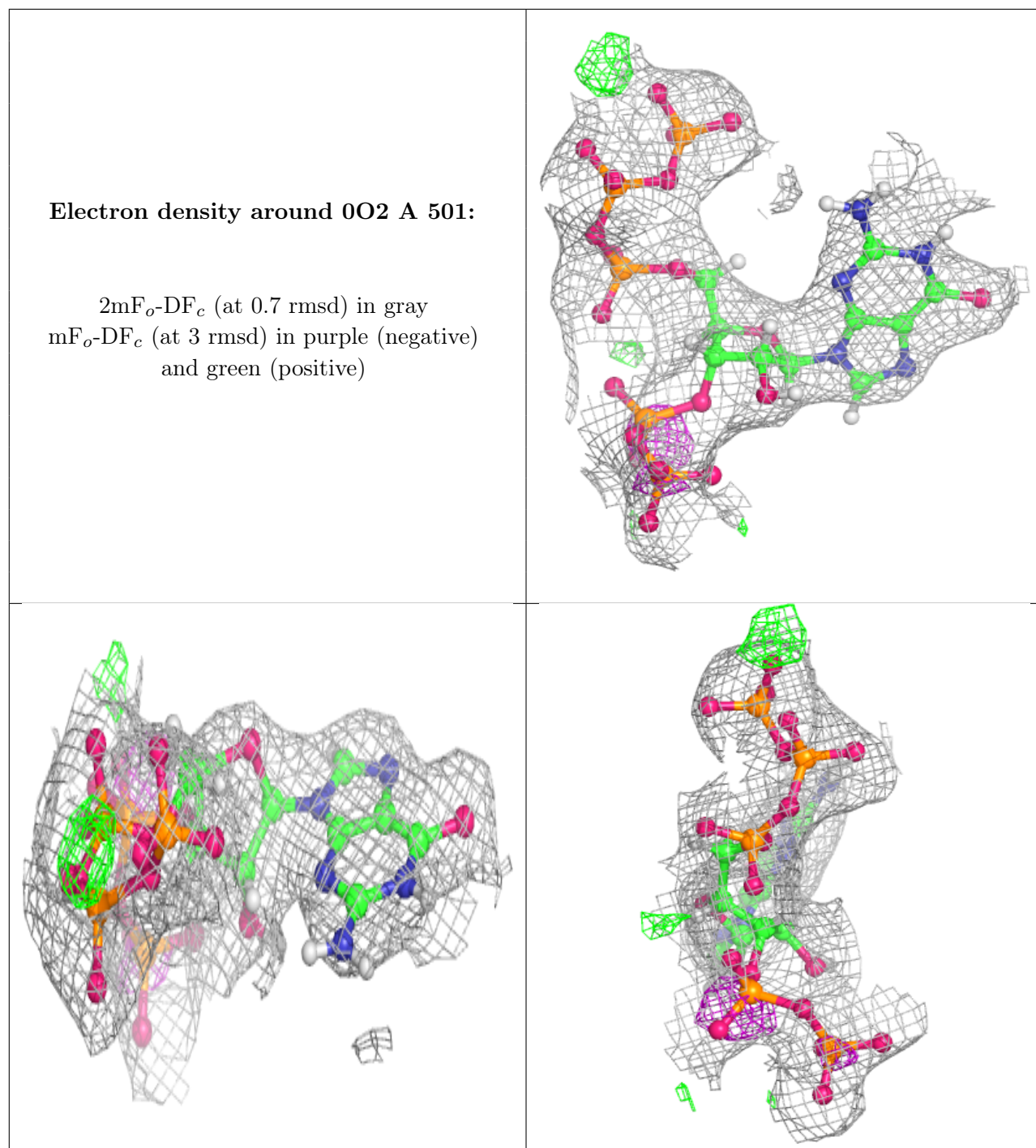


**Electron density around GUN B 502:**

$2mF_o-DF_c$  (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.