W O R L D W I D E

wwPDB

PROTEIN DATA BANK

wwPDB X-ray Structure Validation Summary Report (i)

Mar 23, 2021 – 09:09 pm GMT

PDB ID	:	6ZXC
Title	:	Diguanylate cyclase DgcR (I-site mutant) in activated state
Authors	:	Teixeira, R.D.; Schirmer, T.
Deposited on	:	2020-07-29
Resolution	:	2.80 Å(reported)

This is a wwPDB X-ray Structure Validation Summary Report for a publicly released PDB entry.

We welcome your comments at *validation@mail.wwpdb.org*
A user guide is available at
https://www.wwpdb.org/validation/2017/XrayValidationReportHelp
with specific help available everywhere you see the (i) symbol.

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

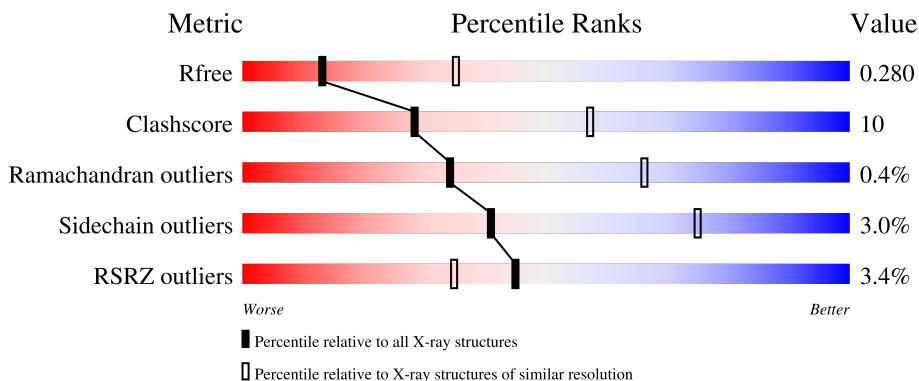|		
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.17.2.dev2
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.17.2.dev2

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 2.80 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	Percentile Ranks	Value
Rfree		0.280
Clashscore		10
Ramachandran outliers		0.4%
Sidechain outliers		3.0%
RSRZ outliers		3.4%

Worse — *Better*

■ Percentile relative to all X-ray structures
▯ Percentile relative to X-ray structures of similar resolution

Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	3140 (2.80-2.80)
Clashscore	141614	3569 (2.80-2.80)
Ramachandran outliers	138981	3498 (2.80-2.80)
Sidechain outliers	138945	3500 (2.80-2.80)
RSRZ outliers	127900	3078 (2.80-2.80)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for >=3, 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions <=5% 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	318	79% 11% · 8%
1	B	318	79% 12% · 8%
1	C	318	3% 69% 21% · 8%
1	D	318	9% 71% 18% · · 8%

2 Entry composition (i)

There are 4 unique types of molecules in this entry. The entry contains 9529 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, the ZeroOcc column contains the number of atoms modelled with zero occupancy, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

- Molecule 1 is a protein called Putative GGDEF/response regulator receiver domain protein.

Mol	Chain	Residues	Atoms							ZeroOcc	AltConf	Trace
1	A	293	Total	Be	C	F	N	O	S	0	0	0
			2340	1	1479	3	400	450	7			
1	B	293	Total	Be	C	F	N	O	S	0	0	0
			2340	1	1479	3	400	450	7			
1	C	293	Total	Be	C	F	N	O	S	0	0	0
			2340	1	1479	3	400	450	7			
1	D	293	Total	Be	C	F	N	O	S	0	0	0
			2340	1	1479	3	400	450	7			

There are 88 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-19	MET	-	initiating methionine	UNP B0SUI1
A	-18	GLY	-	expression tag	UNP B0SUI1
A	-17	SER	-	expression tag	UNP B0SUI1
A	-16	SER	-	expression tag	UNP B0SUI1
A	-15	HIS	-	expression tag	UNP B0SUI1
A	-14	HIS	-	expression tag	UNP B0SUI1
A	-13	HIS	-	expression tag	UNP B0SUI1
A	-12	HIS	-	expression tag	UNP B0SUI1
A	-11	HIS	-	expression tag	UNP B0SUI1
A	-10	HIS	-	expression tag	UNP B0SUI1
A	-9	SER	-	expression tag	UNP B0SUI1
A	-8	SER	-	expression tag	UNP B0SUI1
A	-7	GLY	-	expression tag	UNP B0SUI1
A	-6	LEU	-	expression tag	UNP B0SUI1
A	-5	VAL	-	expression tag	UNP B0SUI1
A	-4	PRO	-	expression tag	UNP B0SUI1
A	-3	ARG	-	expression tag	UNP B0SUI1
A	-2	GLY	-	expression tag	UNP B0SUI1
A	-1	SER	-	expression tag	UNP B0SUI1
A	0	HIS	-	expression tag	UNP B0SUI1
A	206	ALA	ARG	engineered mutation	UNP B0SUI1

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Chain	Residue	Modelled	Actual	Comment	Reference
A	209	ALA	ASP	engineered mutation	UNP B0SUI1
B	-19	MET	-	initiating methionine	UNP B0SUI1
B	-18	GLY	-	expression tag	UNP B0SUI1
B	-17	SER	-	expression tag	UNP B0SUI1
B	-16	SER	-	expression tag	UNP B0SUI1
B	-15	HIS	-	expression tag	UNP B0SUI1
B	-14	HIS	-	expression tag	UNP B0SUI1
B	-13	HIS	-	expression tag	UNP B0SUI1
B	-12	HIS	-	expression tag	UNP B0SUI1
B	-11	HIS	-	expression tag	UNP B0SUI1
B	-10	HIS	-	expression tag	UNP B0SUI1
B	-9	SER	-	expression tag	UNP B0SUI1
B	-8	SER	-	expression tag	UNP B0SUI1
B	-7	GLY	-	expression tag	UNP B0SUI1
B	-6	LEU	-	expression tag	UNP B0SUI1
B	-5	VAL	-	expression tag	UNP B0SUI1
B	-4	PRO	-	expression tag	UNP B0SUI1
B	-3	ARG	-	expression tag	UNP B0SUI1
B	-2	GLY	-	expression tag	UNP B0SUI1
B	-1	SER	-	expression tag	UNP B0SUI1
B	0	HIS	-	expression tag	UNP B0SUI1
B	206	ALA	ARG	engineered mutation	UNP B0SUI1
B	209	ALA	ASP	engineered mutation	UNP B0SUI1
C	-19	MET	-	initiating methionine	UNP B0SUI1
C	-18	GLY	-	expression tag	UNP B0SUI1
C	-17	SER	-	expression tag	UNP B0SUI1
C	-16	SER	-	expression tag	UNP B0SUI1
C	-15	HIS	-	expression tag	UNP B0SUI1
C	-14	HIS	-	expression tag	UNP B0SUI1
C	-13	HIS	-	expression tag	UNP B0SUI1
C	-12	HIS	-	expression tag	UNP B0SUI1
C	-11	HIS	-	expression tag	UNP B0SUI1
C	-10	HIS	-	expression tag	UNP B0SUI1
C	-9	SER	-	expression tag	UNP B0SUI1
C	-8	SER	-	expression tag	UNP B0SUI1
C	-7	GLY	-	expression tag	UNP B0SUI1
C	-6	LEU	-	expression tag	UNP B0SUI1
C	-5	VAL	-	expression tag	UNP B0SUI1
C	-4	PRO	-	expression tag	UNP B0SUI1
C	-3	ARG	-	expression tag	UNP B0SUI1
C	-2	GLY	-	expression tag	UNP B0SUI1
C	-1	SER	-	expression tag	UNP B0SUI1

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Chain	Residue	Modelled	Actual	Comment	Reference
C	0	HIS	-	expression tag	UNP B0SUI1
C	206	ALA	ARG	engineered mutation	UNP B0SUI1
C	209	ALA	ASP	engineered mutation	UNP B0SUI1
D	-19	MET	-	initiating methionine	UNP B0SUI1
D	-18	GLY	-	expression tag	UNP B0SUI1
D	-17	SER	-	expression tag	UNP B0SUI1
D	-16	SER	-	expression tag	UNP B0SUI1
D	-15	HIS	-	expression tag	UNP B0SUI1
D	-14	HIS	-	expression tag	UNP B0SUI1
D	-13	HIS	-	expression tag	UNP B0SUI1
D	-12	HIS	-	expression tag	UNP B0SUI1
D	-11	HIS	-	expression tag	UNP B0SUI1
D	-10	HIS	-	expression tag	UNP B0SUI1
D	-9	SER	-	expression tag	UNP B0SUI1
D	-8	SER	-	expression tag	UNP B0SUI1
D	-7	GLY	-	expression tag	UNP B0SUI1
D	-6	LEU	-	expression tag	UNP B0SUI1
D	-5	VAL	-	expression tag	UNP B0SUI1
D	-4	PRO	-	expression tag	UNP B0SUI1
D	-3	ARG	-	expression tag	UNP B0SUI1
D	-2	GLY	-	expression tag	UNP B0SUI1
D	-1	SER	-	expression tag	UNP B0SUI1
D	0	HIS	-	expression tag	UNP B0SUI1
D	206	ALA	ARG	engineered mutation	UNP B0SUI1
D	209	ALA	ASP	engineered mutation	UNP B0SUI1

- Molecule 2 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	3	Total 3	Mg 3	0	0
2	B	3	Total 3	Mg 3	0	0
2	C	3	Total 3	Mg 3	0	0
2	D	3	Total 3	Mg 3	0	0

- Molecule 3 is 3'-DEOXY-GUANOSINE-5'-TRIPHOSPHATE (three-letter code: GH3) (formula: $C_{10}H_{16}N_5O_{13}P_3$).

GH3

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
3	A	1	Total	C	N	O	P	0	0
			31	10	5	13	3		
3	B	1	Total	C	N	O	P	0	0
			31	10	5	13	3		
3	C	1	Total	C	N	O	P	0	0
			31	10	5	13	3		
3	D	1	Total	C	N	O	P	0	0
			31	10	5	13	3		

• Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	13	Total	O	0	0
			13	13		
4	B	9	Total	O	0	0
			9	9		
4	C	10	Total	O	0	0
			10	10		
4	D	1	Total	O	0	0
			1	1		

3 Residue-property plots ⓘ

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: Putative GGDEF/response regulator receiver domain protein
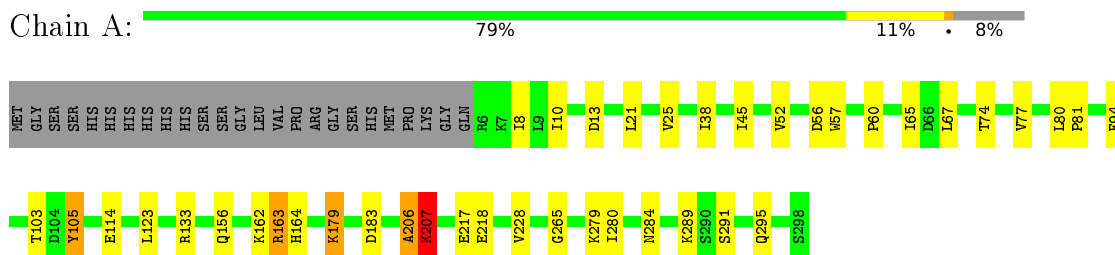
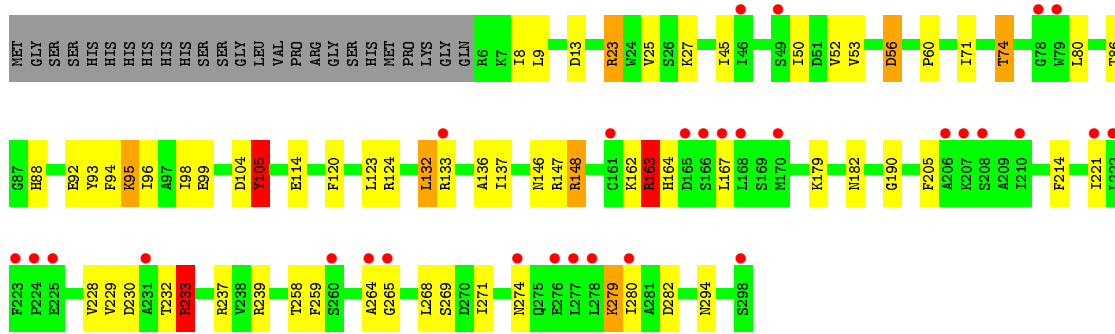• Molecule 1: Putative GGDEF/response regulator receiver domain protein
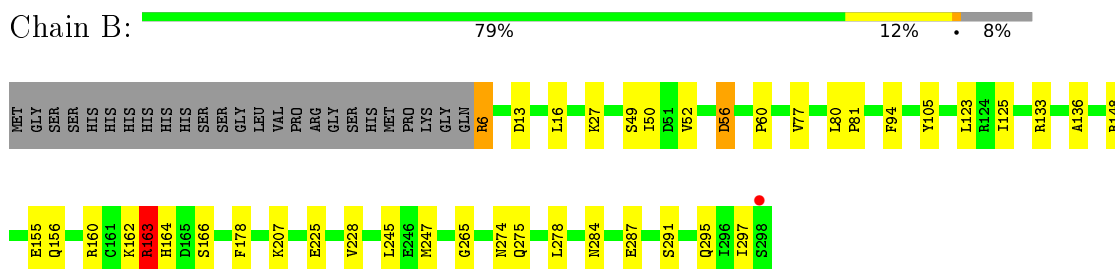
• Molecule 1: Putative GGDEF/response regulator receiver domain protein
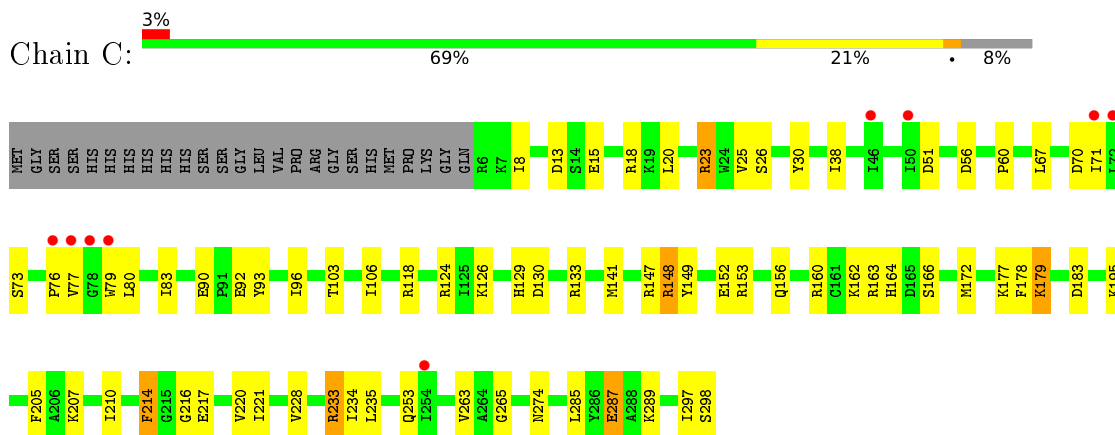
• Molecule 1: Putative GGDEF/response regulator receiver domain protein

4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 21 21 2	Depositor
Cell constants a, b, c, α, β, γ	132.81Å 247.37Å 41.54Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	30.00 – 2.80 45.26 – 2.80	Depositor EDS
% Data completeness (in resolution range)	93.7 (30.00-2.80) 84.4 (45.26-2.80)	Depositor EDS
R_{merge}	0.14	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	2.04 (at 2.81Å)	Xtriage
Refinement program	REFMAC 5.8.0267	Depositor
R, R_{free}	0.237 , 0.288 0.228 , 0.280	Depositor DCC
R_{free} test set	1446 reflections (4.90%)	wwPDB-VP
Wilson B-factor (Å^2)	56.4	Xtriage
Anisotropy	0.185	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.33 , 44.1	EDS
L-test for twinning[2]	$< |L| > = 0.48$, $< L^2 > = 0.30$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.93	EDS
Total number of atoms	9529	wwPDB-VP
Average B, all atoms (Å^2)	71.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.76% of the height of the origin peak. No significant pseudotranslation is detected.*

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[1]Intensities estimated from amplitudes.

[2]Theoretical values of $< |L| >$, $< L^2 >$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality (i)

5.1 Standard geometry (i)

Bond lengths and bond angles in the following residue types are not validated in this section: MG, GH3, BFD

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	0.80	2/2362 (0.1%)	0.86	0/3180
1	B	0.78	0/2362	0.90	0/3180
1	C	0.75	0/2362	0.88	0/3180
1	D	0.73	0/2362	0.94	6/3180 (0.2%)
All	All	0.77	2/9448 (0.0%)	0.90	6/12720 (0.0%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand.A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	1

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	114	GLU	CD-OE1	8.07	1.34	1.25
1	A	218	GLU	CD-OE1	5.12	1.31	1.25

The worst 5 of 6 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	D	163	ARG	CB-CG-CD	7.99	132.37	111.60
1	D	114	GLU	CB-CA-C	-6.98	96.45	110.40
1	D	133	ARG	CG-CD-NE	-5.79	99.64	111.80
1	D	163	ARG	N-CA-CB	5.14	119.85	110.60
1	D	105	TYR	CB-CG-CD1	5.01	124.01	121.00

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	206	ALA	Peptide

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	2340	0	2364	29	0
1	B	2340	0	2364	26	0
1	C	2340	0	2364	78	0
1	D	2340	0	2364	63	0
2	A	3	0	0	0	0
2	B	3	0	0	0	0
2	C	3	0	0	0	0
2	D	3	0	0	0	0
3	A	31	0	12	2	0
3	B	31	0	12	1	0
3	C	31	0	12	5	0
3	D	31	0	12	1	0
4	A	13	0	0	0	0
4	B	9	0	0	0	0
4	C	10	0	0	0	0
4	D	1	0	0	0	0
All	All	9529	0	9504	187	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 10.

The worst 5 of 187 close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:217:GLU:OE2	3:C:301:GH3:O1A	1.89	0.90
1:C:73:SER:O	1:C:156:GLN:HG3	1.72	0.89
1:A:80:LEU:HD23	1:A:81:PRO:HD2	1.54	0.87
1:C:77:VAL:HG11	1:C:129:HIS:CE1	2.09	0.86
1:D:205:PHE:HE2	1:D:221:ILE:HD13	1.41	0.85

There are no symmetry-related clashes.

5.3 Torsion angles ⓘ

5.3.1 Protein backbone ⓘ

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	290/318 (91%)	278 (96%)	10 (3%)	2 (1%)	22	53
1	B	290/318 (91%)	281 (97%)	8 (3%)	1 (0%)	41	72
1	C	290/318 (91%)	281 (97%)	8 (3%)	1 (0%)	41	72
1	D	290/318 (91%)	279 (96%)	10 (3%)	1 (0%)	41	72
All	All	1160/1272 (91%)	1119 (96%)	36 (3%)	5 (0%)	34	66

All (5) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	207	LYS
1	C	163	ARG
1	A	163	ARG
1	B	163	ARG
1	D	148	ARG

5.3.2 Protein sidechains ⓘ

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	256/277 (92%)	252 (98%)	4 (2%)	62	88
1	B	256/277 (92%)	248 (97%)	8 (3%)	40	74
1	C	256/277 (92%)	248 (97%)	8 (3%)	40	74

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	D	256/277 (92%)	245 (96%)	11 (4%)	29	62
All	All	1024/1108 (92%)	993 (97%)	31 (3%)	41	75

5 of 31 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	179	LYS
1	D	233	ARG
1	C	235	LEU
1	D	274	ASN
1	D	105	TYR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 13 such sidechains are listed below:

Mol	Chain	Res	Type
1	C	284	ASN
1	D	164	HIS
1	D	295	GLN
1	D	253	GLN
1	D	274	ASN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

4 non-standard protein/DNA/RNA residues 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	#$|Z| > 2$
1	BFD	D	56	2,1	8,11,12	4.76	3 (37%)	3,15,17	0.45	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	#|Z| > 2	Counts	RMSZ	#|Z| > 2
1	BFD	C	56	2,1	8,11,12	5.01	3 (37%)	3,15,17	0.24	0
1	BFD	A	56	1	8,11,12	5.09	4 (50%)	3,15,17	0.94	0
1	BFD	B	56	2,1	8,11,12	4.23	3 (37%)	3,15,17	0.62	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
1	BFD	D	56	2,1	-	2/5/11/13	-
1	BFD	C	56	2,1	-	2/5/11/13	-
1	BFD	A	56	1	-	2/5/11/13	-
1	BFD	B	56	2,1	-	2/5/11/13	-

The worst 5 of 13 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	56	BFD	F3-BE	9.71	1.77	1.54
1	B	56	BFD	F3-BE	9.13	1.76	1.54
1	D	56	BFD	F3-BE	9.06	1.76	1.54
1	C	56	BFD	F3-BE	8.93	1.75	1.54
1	C	56	BFD	F1-BE	8.18	1.74	1.54

There are no bond angle outliers.

There are no chirality outliers.

5 of 8 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
1	A	56	BFD	CA-CB-CG-OD2
1	B	56	BFD	CA-CB-CG-OD2
1	C	56	BFD	CA-CB-CG-OD2
1	D	56	BFD	CA-CB-CG-OD2
1	A	56	BFD	CA-CB-CG-OD1

There are no ring outliers.

2 monomers are involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
1	D	56	BFD	1	0
1	B	56	BFD	1	0

5.5 Carbohydrates (i)

There are no monosaccharides in this entry.

5.6 Ligand geometry (i)

Of 16 ligands modelled in this entry, 12 are monoatomic - leaving 4 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	#$|Z| > 2$
3	GH3	A	301	2	25,33,33	1.54	3 (12%)	30,52,52	2.53	10 (33%)
3	GH3	C	301	2	25,33,33	1.42	4 (16%)	30,52,52	2.04	9 (30%)
3	GH3	B	301	2	25,33,33	1.03	1 (4%)	30,52,52	2.18	10 (33%)
3	GH3	D	301	2	25,33,33	1.41	3 (12%)	30,52,52	1.93	8 (26%)

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
3	GH3	A	301	2	-	4/18/34/34	0/3/3/3
3	GH3	C	301	2	-	5/18/34/34	0/3/3/3
3	GH3	B	301	2	-	7/18/34/34	0/3/3/3
3	GH3	D	301	2	-	4/18/34/34	0/3/3/3

The worst 5 of 11 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	301	GH3	C2'-C1'	-5.08	1.49	1.54

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	D	301	GH3	C6-C5	5.00	1.50	1.41
3	C	301	GH3	C2'-C1'	-4.41	1.50	1.54
3	C	301	GH3	C6-C5	3.50	1.47	1.41
3	A	301	GH3	C5-C4	3.10	1.49	1.40

The worst 5 of 37 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	A	301	GH3	C6-C5-C4	-6.41	114.68	120.80
3	B	301	GH3	C2-N3-C4	5.78	121.95	115.36
3	D	301	GH3	C2-N3-C4	5.53	121.67	115.36
3	A	301	GH3	O4'-C4'-C3'	-5.44	98.06	105.07
3	C	301	GH3	C2-N3-C4	5.05	121.13	115.36

There are no chirality outliers.

5 of 20 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	301	GH3	PB-O3B-PG-O3G
3	B	301	GH3	PB-O3B-PG-O3G
3	B	301	GH3	C5'-O5'-PA-O1A
3	C	301	GH3	PB-O3B-PG-O3G
3	D	301	GH3	O4'-C4'-C5'-O5'

There are no ring outliers.

4 monomers are involved in 9 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	301	GH3	2	0
3	C	301	GH3	5	0
3	B	301	GH3	1	0
3	D	301	GH3	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 then 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.

Ligand GH3 A 301

Bond lengths

Bond angles

Torsions

Rings

Ligand GH3 C 301

Bond lengths

Bond angles

Torsions

Rings

Ligand GH3 B 301

Bond lengths

Bond angles

Torsions

Rings

Ligand GH3 D 301

Bond lengths

Bond angles

Torsions

Rings
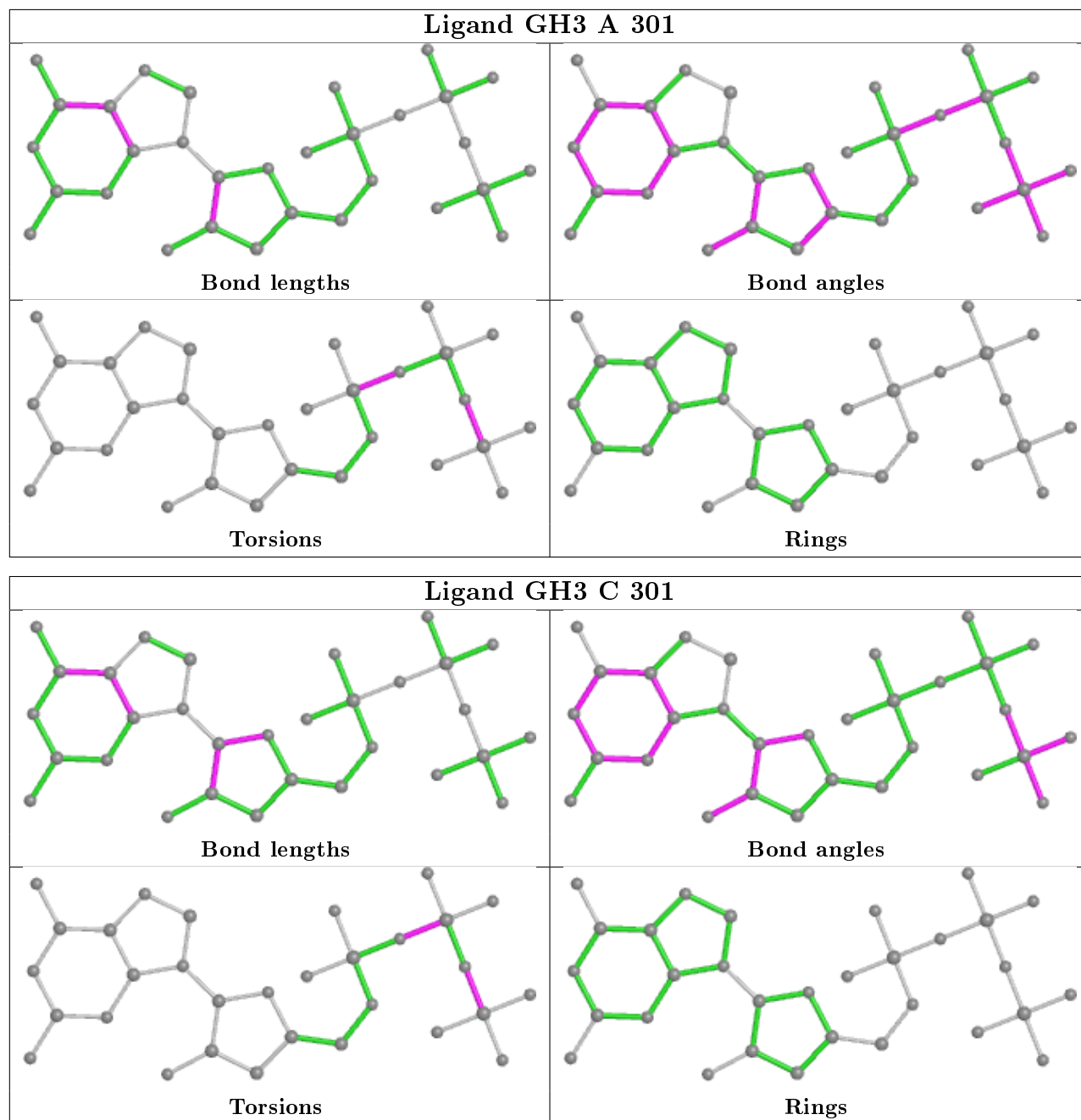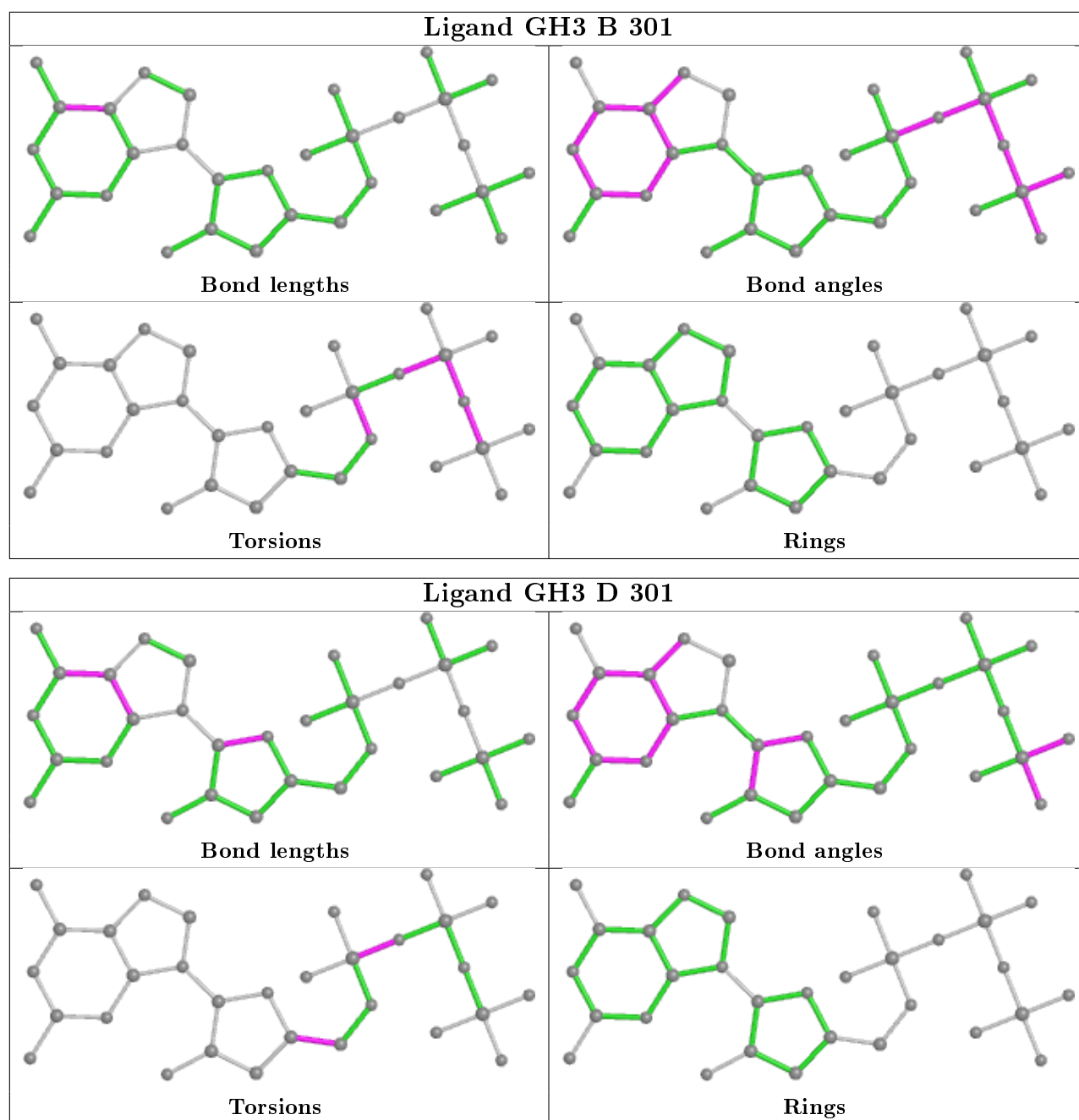
5.7 Other polymers (i)

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 (i)

6.1 Protein, DNA and RNA chains (i)

In the following table, the column labelled '#RSRZ> 2' contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled 'Q< 0.9' lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2			OWAB(Å²)	Q<0.9
1	A	292/318 (91%)	-0.23	0	100	100	34, 53, 85, 108	0
1	B	292/318 (91%)	-0.22	1 (0%)	94	93	33, 53, 91, 132	0
1	C	292/318 (91%)	0.17	9 (3%)	49	39	43, 71, 115, 169	0
1	D	292/318 (91%)	0.45	30 (10%)	6	3	58, 93, 144, 175	0
All	All	1168/1272 (91%)	0.04	40 (3%)	45	35	33, 66, 120, 175	0

The worst 5 of 40 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	78	GLY	11.3
1	C	72	LEU	5.6
1	C	76	PRO	4.7
1	D	224	PRO	4.6
1	D	265	GLY	4.1

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

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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å²)	Q<0.9
1	BFD	D	56	12/13	0.91	0.18	68,73,78,83	0
1	BFD	C	56	12/13	0.93	0.15	64,66,73,80	0
1	BFD	A	56	12/13	0.94	0.16	41,45,53,57	0
1	BFD	B	56	12/13	0.96	0.19	36,44,49,53	0

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, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

| Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
2	MG	A	300	1/1	0.86	0.32	128,128,128,128	0
2	MG	D	302	1/1	0.86	0.06	106,106,106,106	0
2	MG	C	302	1/1	0.89	0.13	46,46,46,46	0
3	GH3	D	301	31/31	0.89	0.20	80,107,123,125	0
2	MG	D	303	1/1	0.93	0.14	81,81,81,81	0
2	MG	B	300	1/1	0.93	0.17	48,48,48,48	0
2	MG	A	302	1/1	0.95	0.18	45,45,45,45	0
2	MG	D	300	1/1	0.96	0.19	72,72,72,72	0
2	MG	B	302	1/1	0.96	0.10	76,76,76,76	0
3	GH3	A	301	31/31	0.97	0.15	49,55,60,61	0
2	MG	B	303	1/1	0.98	0.21	29,29,29,29	0
3	GH3	B	301	31/31	0.98	0.15	38,52,56,63	0
3	GH3	C	301	31/31	0.98	0.14	36,50,60,67	0
2	MG	C	300	1/1	0.98	0.08	50,50,50,50	0
2	MG	C	303	1/1	0.99	0.13	28,28,28,28	0
2	MG	A	303	1/1	0.99	0.11	23,23,23,23	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 GH3 D 301:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
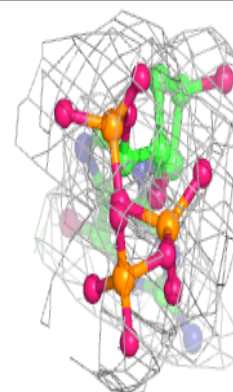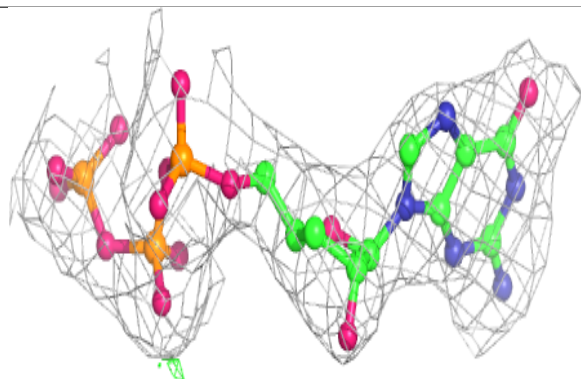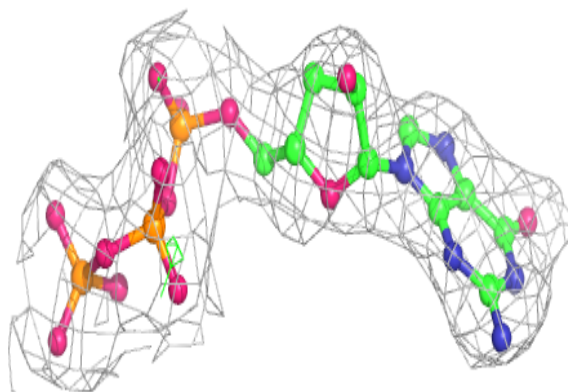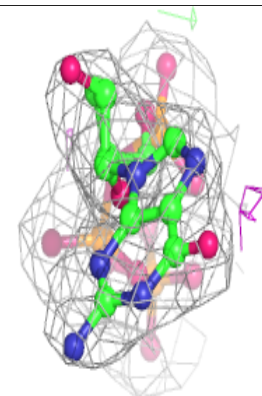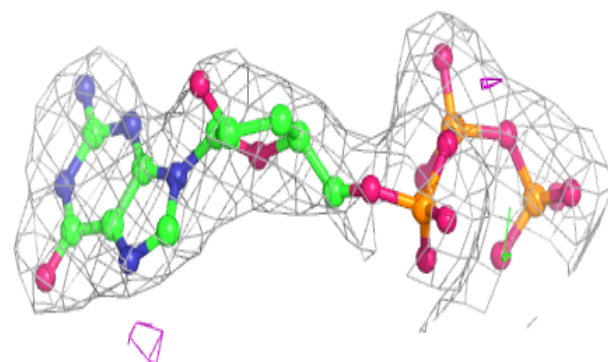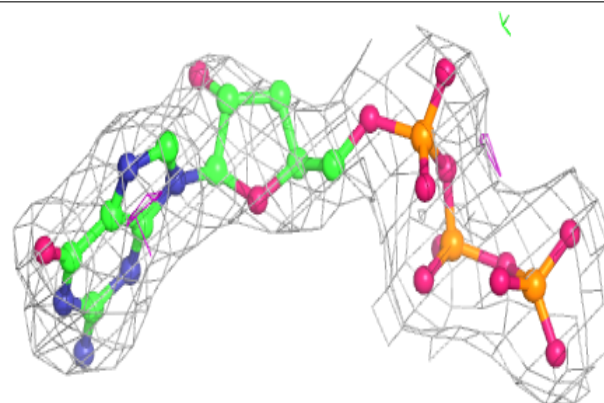mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)
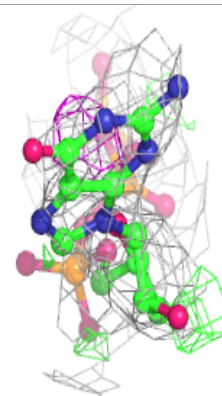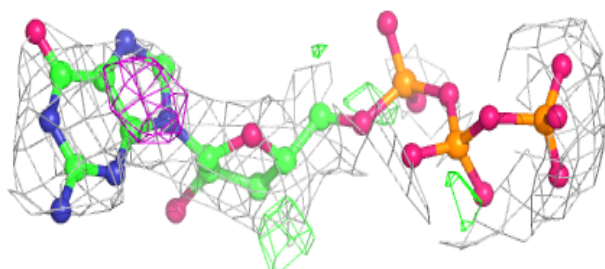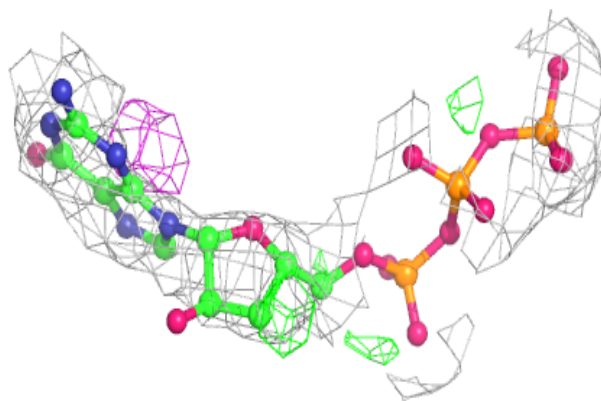
Electron density around GH3 A 301:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)
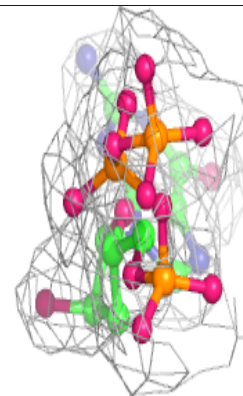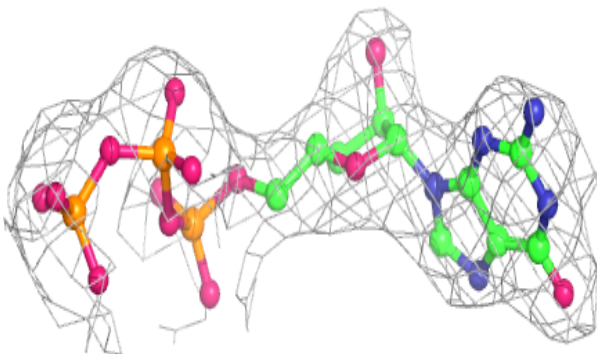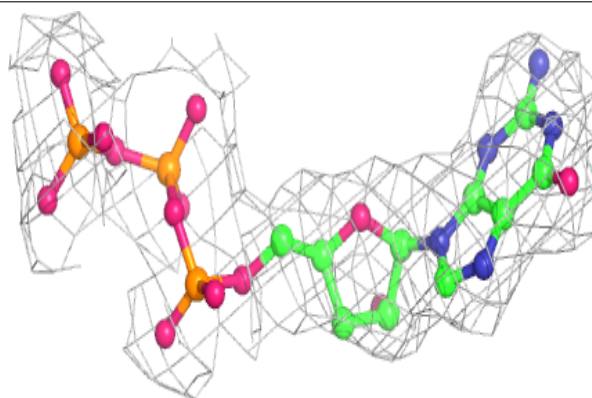
Electron density around GH3 B 301:

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

Electron density around GH3 C 301:

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

6.5 Other polymers (i)

There are no such residues in this entry.