wwPDB X-ray Structure Validation Summary Report ⓘ

Oct 10, 2021 – 02:15 PM EDT

PDB ID	:	3G8T
Title	:	Crystal structure of the G33A mutant Bacillus anthracis glmS ribozyme bound to GlcN6P
Authors	:	Strobel, S.A.; Cochrane, J.C.; Lipchock, S.V.; Smith, K.D.
Deposited on	:	2009-02-12
Resolution	:	3.00 Å(reported)

The following versions of software and data (see references ⓘ) 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	:	2.23.2
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)	:	2.23.2

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 3.00 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.

■ Percentile relative to all X-ray structures

▯ Percentile relative to X-ray structures of similar resolution
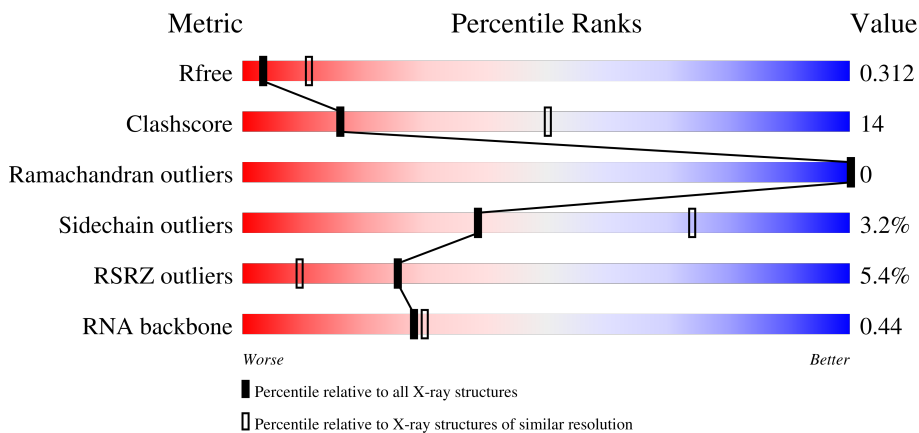
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	2092 (3.00-3.00)
Clashscore	141614	2416 (3.00-3.00)
Ramachandran outliers	138981	2333 (3.00-3.00)
Sidechain outliers	138945	2336 (3.00-3.00)
RSRZ outliers	127900	1990 (3.00-3.00)
RNA backbone	3102	1173 (3.30-2.70)

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	98	79% 13% 8%
1	B	98	81% 11% 8%
1	C	98	88% · 8%
1	D	98	86% · 10%

Continued on next page...

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Mol	Chain	Length	Quality of chain
2	E	13	15% / 23% / 23% / 54%
2	F	13	8% / 62% / 8% / 23% / 8%
2	G	13	15% / 38% / 31% / 23% / 8%
2	H	13	15% / 38% / 38% / 15% / 8%
3	P	141	9% / 62% / 25% / 12%
3	Q	141	8% / 57% / 28% / 16%
3	R	141	5% / 63% / 24% / 12%
3	S	141	7% / 57% / 28% / 16%

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

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
2	A2M	F	0	-	-	X	-
2	A2M	G	0	-	-	X	-

2 Entry composition (i)

There are 6 unique types of molecules in this entry. The entry contains 16182 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 U1 small nuclear ribonucleoprotein A.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	90	Total	C	N	O	S	0	0	0
			716	459	125	129	3			
1	B	90	Total	C	N	O	S	0	0	0
			716	459	125	129	3			
1	C	90	Total	C	N	O	S	0	0	0
			716	459	125	129	3			
1	D	88	Total	C	N	O	S	0	0	0
			706	453	123	127	3			

There are 8 discrepancies between the modelled and reference sequences:

| Chain	Residue	Modelled	Actual	Comment	Reference
A	31	HIS	TYR	engineered mutation	UNP P09012
A	36	ARG	GLN	engineered mutation	UNP P09012
B	31	HIS	TYR	engineered mutation	UNP P09012
B	36	ARG	GLN	engineered mutation	UNP P09012
C	31	HIS	TYR	engineered mutation	UNP P09012
C	36	ARG	GLN	engineered mutation	UNP P09012
D	31	HIS	TYR	engineered mutation	UNP P09012
D	36	ARG	GLN	engineered mutation	UNP P09012

- Molecule 2 is a RNA chain called RNA (5'-R(*AP*(A2M)P*GP*CP*GP*CP*CP*AP*GP*AP*AP*CP*U)-3').

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	E	13	Total	C	N	O	P	0	0	0
			277	126	54	85	12			
2	F	13	Total	C	N	O	P	0	0	0
			277	126	54	85	12			
2	G	13	Total	C	N	O	P	0	0	0
			277	126	54	85	12			
2	H	13	Total	C	N	O	P	0	0	0
			277	126	54	85	12			

- Molecule 3 is a RNA chain called glmS glucosamine-6-phosphate activated ribozyme.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	P	141	Total 3010	C 1340	N 532	O 995	P 143	0	0	0
3	Q	141	Total 3018	C 1344	N 535	O 996	P 143	0	0	0
3	R	141	Total 3018	C 1344	N 535	O 996	P 143	0	0	0
3	S	141	Total 3018	C 1344	N 535	O 996	P 143	0	0	0

- Molecule 4 is 2-amino-2-deoxy-6-O-phosphono-alpha-D-glucopyranose (three-letter code: GLP) (formula: $C_6H_{14}NO_8P$).
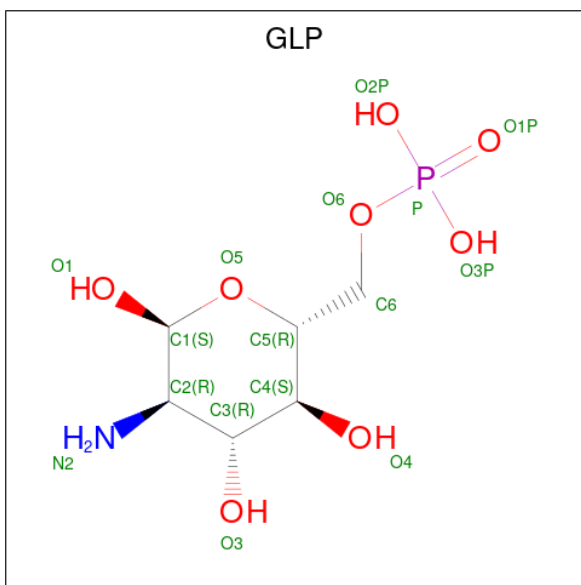
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
4	E	1	Total 16	C 6	N 1	O 8	P 1	0	0
4	Q	1	Total 16	C 6	N 1	O 8	P 1	0	0
4	R	1	Total 16	C 6	N 1	O 8	P 1	0	0
4	H	1	Total 16	C 6	N 1	O 8	P 1	0	0

- Molecule 5 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	P	2	Total 2	Mg 2	0	0
5	F	2	Total 2	Mg 2	0	0
5	Q	3	Total 3	Mg 3	0	0
5	R	3	Total 3	Mg 3	0	0

- Molecule 6 is water.

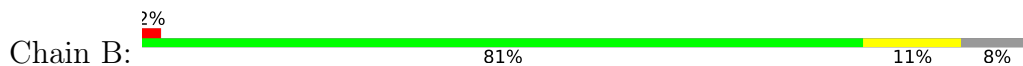| Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	2	Total 2	O 2	0	0
6	E	2	Total 2	O 2	0	0
6	P	19	Total 19	O 19	0	0
6	B	5	Total 5	O 5	0	0
6	F	1	Total 1	O 1	0	0
6	Q	12	Total 12	O 12	0	0
6	C	3	Total 3	O 3	0	0
6	G	1	Total 1	O 1	0	0
6	R	14	Total 14	O 14	0	0
6	D	2	Total 2	O 2	0	0
6	H	3	Total 3	O 3	0	0
6	S	18	Total 18	O 18	0	0

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.
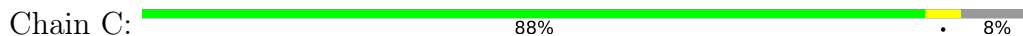
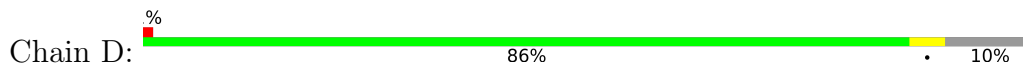- Molecule 1: U1 small nuclear ribonucleoprotein A

Chain A:

- Molecule 1: U1 small nuclear ribonucleoprotein A

Chain B:

- Molecule 1: U1 small nuclear ribonucleoprotein A

Chain C:

- Molecule 1: U1 small nuclear ribonucleoprotein A

Chain D:
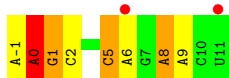
- Molecule 2: RNA (5'-R(*AP*(A2M)P*GP*CP*GP*CP*CP*AP*GP*AP*AP*CP*U)-3')

Chain E:

- Molecule 2: RNA (5'-R(*AP*(A2M)P*GP*CP*GP*CP*CP*AP*GP*AP*AP*CP*U)-3')

Chain F:
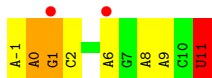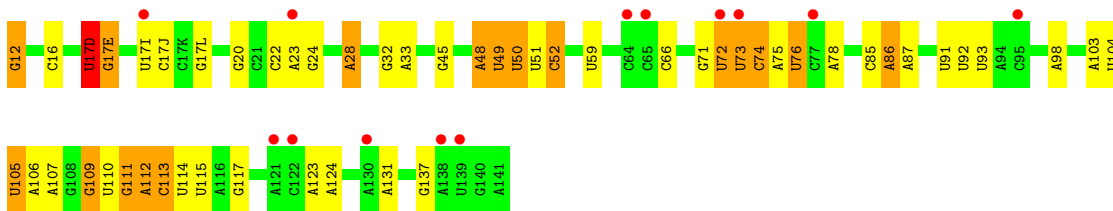

• Molecule 2: RNA (5'-R(*AP*(A2M)P*GP*CP*GP*CP*CP*AP*GP*AP*AP*CP*U)-3')

Chain G:

• Molecule 2: RNA (5'-R(*AP*(A2M)P*GP*CP*GP*CP*CP*AP*GP*AP*AP*CP*U)-3')

Chain H:

• Molecule 3: glmS glucosamine-6-phosphate activated ribozyme

Chain P:

• Molecule 3: glmS glucosamine-6-phosphate activated ribozyme

Chain Q:

• Molecule 3: glmS glucosamine-6-phosphate activated ribozyme

Chain R:

U110 G111 A112 C113 U114 U115 G120 A121 G126 G127 U128 G133 U134 G135 U139 G140 A141

• Molecule 3: glmS glucosamine-6-phosphate activated ribozyme

Chain S:

7%

57%   28%   16%

G12 C16 C17A A17B U17C U17D G17E C17F A17G C17H U17I C17J C17K G17L U25 A28 C29 G30 A31 G32 A33 U34 G45 U50 U51 C52 G57 A58 U59 U63 C64 U73 A81 C82 C83 G84 C85 A86 A87 G88 C89 U90 U91 C95 U96 U97 A98 A99 A100

A103 A106 A107 G108 G109 U110 G111 A112 C113 U114 U115 A116 G117 U118 G119 G120 A121 C122 A123 G129 A130 A131 G135 U136 G137 G140 A141

W O R L D W I D E
PDB
PROTEIN DATA BANK

4 Data and refinement statistics ⓘ

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	48.39Å　　232.67Å　　106.58Å 90.00°　　92.21°　　　90.00°	Depositor
Resolution (Å)	28.23　–　3.00 28.22　–　3.00	Depositor EDS
% Data completeness (in resolution range)	97.7 (28.23-3.00) 97.8 (28.22-3.00)	Depositor EDS
R_{merge}	0.12	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.88 (at 3.00Å)	Xtriage
Refinement program	REFMAC 5.5.0066	Depositor
R, R_{free}	0.250　,　0.318 0.264　,　0.312	Depositor DCC
R_{free} test set	2333 reflections (5.09%)	wwPDB-VP
Wilson B-factor (Å^2)	64.2	Xtriage
Anisotropy	0.538	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.24 , 50.3	EDS
L-test for twinning[2]	$< |L| > = 0.49, < L^2 > = 0.32$	Xtriage
Estimated twinning fraction	0.046 for h,-k,-l	Xtriage
F_o,F_c correlation	0.87	EDS
Total number of atoms	16182	wwPDB-VP
Average B, all atoms (Å^2)	67.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.66% 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 ⓘ

5.1 Standard geometry ⓘ

Bond lengths and bond angles in the following residue types are not validated in this section: GTP, A2M, GLP, MG

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	#$|Z|$ >5	RMSZ	#$|Z|$ >5
1	A	0.31	0/729	0.47	0/979
1	B	0.30	0/729	0.46	0/979
1	C	0.30	0/729	0.46	0/979
1	D	0.31	0/719	0.45	0/965
2	E	1.02	5/284 (1.8%)	1.12	0/441
2	F	0.52	0/284	0.98	0/441
2	G	0.55	0/284	1.01	1/441 (0.2%)
2	H	0.54	0/284	1.01	1/441 (0.2%)
3	P	0.59	0/3330	1.07	3/5188 (0.1%)
3	Q	0.56	0/3339	1.04	0/5202
3	R	0.59	1/3339 (0.0%)	1.07	2/5202 (0.0%)
3	S	0.59	0/3339	1.03	2/5202 (0.0%)
All	All	0.56	6/17389 (0.0%)	0.99	9/26460 (0.0%)

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

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	E	-1	A	C5-C4	-5.94	1.34	1.38
2	E	-1	A	N3-C4	-5.36	1.31	1.34
3	R	17(J)	C	C1'-N1	5.28	1.56	1.48
2	E	-1	A	N7-C5	-5.27	1.36	1.39
2	E	-1	A	N9-C4	-5.24	1.34	1.37

The worst 5 of 9 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	S	97	U	C2-N1-C1'	5.81	124.67	117.70
3	R	86	A	P-O3'-C3'	5.78	126.64	119.70
2	H	11	U	C3'-C2'-C1'	5.64	106.01	101.50
2	G	5	C	O4'-C1'-N1	5.47	112.57	108.20
3	P	86	A	C1'-O4'-C4'	-5.34	105.62	109.90

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	716	0	721	6	0
1	B	716	0	721	7	0
1	C	716	0	721	1	0
1	D	706	0	714	1	0
2	E	277	0	146	26	0
2	F	277	0	146	13	0
2	G	277	0	146	15	0
2	H	277	0	146	10	0
3	P	3010	0	1509	71	0
3	Q	3018	0	1514	103	0
3	R	3018	0	1514	49	0
3	S	3018	0	1514	97	0
4	E	16	0	12	2	0
4	H	16	0	12	0	0
4	Q	16	0	12	0	0
4	R	16	0	12	0	0
5	F	2	0	0	0	0
5	P	2	0	0	0	0
5	Q	3	0	0	0	0
5	R	3	0	0	0	0
6	A	2	0	0	2	0
6	B	5	0	0	3	0
6	C	3	0	0	0	0
6	D	2	0	0	0	0
6	E	2	0	0	0	0
6	F	1	0	0	0	0
6	G	1	0	0	0	0
6	H	3	0	0	0	0
6	P	19	0	0	0	0
6	Q	12	0	0	0	0
6	R	14	0	0	0	0
6	S	18	0	0	0	0
All	All	16182	0	9560	365	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 14.

The worst 5 of 365 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)
3:Q:85:C:H1'	3:Q:86:A:OP2	1.47	1.14
3:Q:117:G:H2'	3:Q:118:U:H6	1.13	1.13
3:Q:17(D):U:H1'	3:Q:17(E):G:C5	1.85	1.12
3:S:87:A:H4'	3:S:88:G:OP1	1.44	1.10
3:S:83:C:H4'	3:S:86:A:O2'	1.53	1.08

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	88/98 (90%)	85 (97%)	3 (3%)	0	100	100
1	B	88/98 (90%)	87 (99%)	1 (1%)	0	100	100
1	C	88/98 (90%)	88 (100%)	0	0	100	100
1	D	86/98 (88%)	85 (99%)	1 (1%)	0	100	100
All	All	350/392 (89%)	345 (99%)	5 (1%)	0	100	100

There are no Ramachandran outliers to report.

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	77/88 (88%)	74 (96%)	3 (4%)	32	69
1	B	77/88 (88%)	75 (97%)	2 (3%)	46	78
1	C	77/88 (88%)	74 (96%)	3 (4%)	32	69
1	D	77/88 (88%)	75 (97%)	2 (3%)	46	78
All	All	308/352 (88%)	298 (97%)	10 (3%)	39	74

5 of 10 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	71	SER
1	D	36	ARG
1	D	47	ARG
1	B	36	ARG
1	B	47	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	85	GLN
1	B	67	ASN

5.3.3 RNA ⓘ

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
2	E	12/13 (92%)	7 (58%)	1 (8%)
2	F	12/13 (92%)	4 (33%)	1 (8%)
2	G	12/13 (92%)	4 (33%)	1 (8%)
2	H	12/13 (92%)	3 (25%)	1 (8%)
3	P	139/141 (98%)	35 (25%)	5 (3%)
3	Q	139/141 (98%)	40 (28%)	5 (3%)
3	R	139/141 (98%)	26 (18%)	3 (2%)
3	S	139/141 (98%)	44 (31%)	4 (2%)
All	All	604/616 (98%)	163 (26%)	21 (3%)

5 of 163 RNA backbone outliers are listed below:

Mol	Chain	Res	Type
2	E	0	A2M
2	E	1	G

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Mol	Chain	Res	Type
2	E	2	C
2	E	3	G
2	E	6	A

5 of 21 RNA pucker outliers are listed below:

Mol	Chain	Res	Type
3	R	72	U
3	S	17(F)	C
3	S	115	U
3	S	86	A
2	H	6	A

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

8 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	$\#|Z| > 2$
3	GTP	S	12	3	26,34,34	0.78	0	33,54,54	1.82	6 (18%)
2	A2M	F	0	3,2	18,25,26	0.62	0	18,36,39	0.73	1 (5%)
3	GTP	Q	12	3	26,34,34	0.78	1 (3%)	33,54,54	1.76	7 (21%)
2	A2M	E	0	3,2	18,25,26	0.63	0	18,36,39	0.74	0
3	GTP	R	12	3	26,34,34	0.79	1 (3%)	33,54,54	1.74	6 (18%)
3	GTP	P	12	3	26,34,34	0.78	1 (3%)	33,54,54	1.81	7 (21%)
2	A2M	H	0	3,2	18,25,26	0.62	0	18,36,39	0.73	1 (5%)
2	A2M	G	0	2	18,25,26	0.62	0	18,36,39	0.73	1 (5%)

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	GTP	S	12	3	-	3/18/38/38	0/3/3/3
2	A2M	F	0	3,2	-	2/5/27/28	0/3/3/3
3	GTP	Q	12	3	-	6/18/38/38	0/3/3/3
2	A2M	E	0	3,2	-	2/5/27/28	0/3/3/3
3	GTP	R	12	3	-	5/18/38/38	0/3/3/3
3	GTP	P	12	3	-	6/18/38/38	0/3/3/3
2	A2M	H	0	3,2	-	4/5/27/28	0/3/3/3
2	A2M	G	0	2	-	2/5/27/28	0/3/3/3

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	R	12	GTP	O4'-C1'	2.21	1.44	1.41
3	Q	12	GTP	O4'-C1'	2.04	1.43	1.41
3	P	12	GTP	O4'-C1'	2.03	1.43	1.41

The worst 5 of 29 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	S	12	GTP	N3-C2-N1	-4.96	120.60	127.22
3	P	12	GTP	N3-C2-N1	-4.86	120.73	127.22
3	Q	12	GTP	N3-C2-N1	-4.83	120.77	127.22
3	R	12	GTP	N3-C2-N1	-4.78	120.84	127.22
3	S	12	GTP	C2-N3-C4	4.67	120.69	115.36

There are no chirality outliers.

5 of 30 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	P	12	GTP	C5'-O5'-PA-O1A
3	P	12	GTP	O4'-C4'-C5'-O5'
3	P	12	GTP	C3'-C4'-C5'-O5'
2	F	0	A2M	C3'-C4'-C5'-O5'
3	Q	12	GTP	C5'-O5'-PA-O2A

There are no ring outliers.

7 monomers are involved in 36 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	F	0	A2M	9	0

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Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	Q	12	GTP	1	0
2	E	0	A2M	6	0
3	R	12	GTP	2	0
3	P	12	GTP	1	0
2	H	0	A2M	7	0
2	G	0	A2M	10	0

5.5 Carbohydrates (i)

There are no monosaccharides in this entry.

5.6 Ligand geometry (i)

Of 14 ligands modelled in this entry, 10 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	$\#|Z| > 2$
4	GLP	R	5003	-	16,16,16	0.63	0	23,24,24	1.03	2 (8%)
4	GLP	E	5001	-	16,16,16	0.66	0	23,24,24	0.89	0
4	GLP	H	5004	-	16,16,16	0.63	0	23,24,24	0.96	0
4	GLP	Q	5002	-	16,16,16	0.67	0	23,24,24	1.06	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	GLP	R	5003	-	-	3/6/26/26	0/1/1/1
4	GLP	E	5001	-	-	2/6/26/26	0/1/1/1
4	GLP	H	5004	-	-	2/6/26/26	0/1/1/1
4	GLP	Q	5002	-	-	2/6/26/26	0/1/1/1

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
4	R	5003	GLP	O5-C5-C6	2.17	111.05	106.67
4	R	5003	GLP	O3P-P-O2P	2.01	115.33	107.64

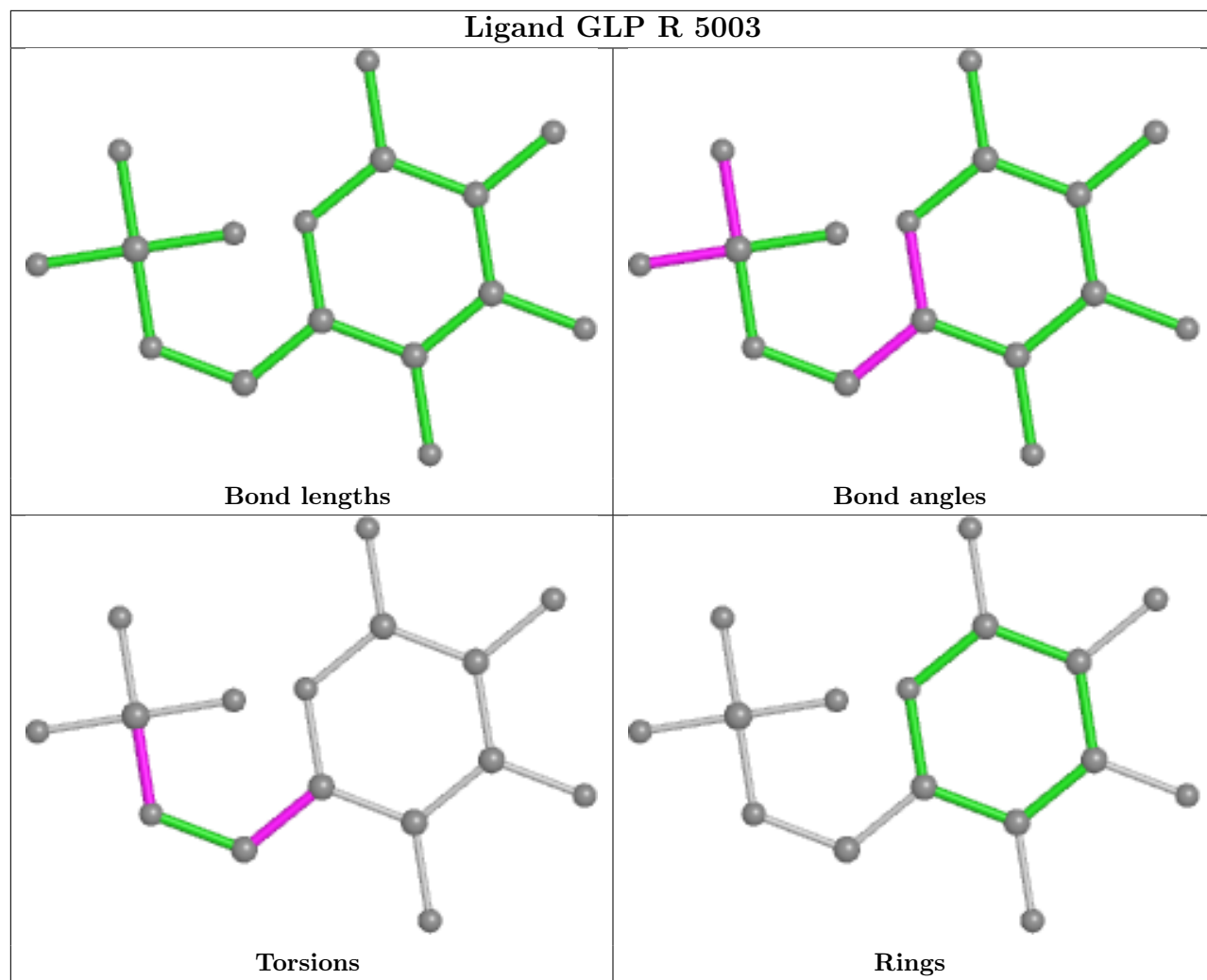There are no chirality outliers.

5 of 9 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	E	5001	GLP	C4-C5-C6-O6
4	E	5001	GLP	O5-C5-C6-O6
4	R	5003	GLP	O5-C5-C6-O6
4	H	5004	GLP	C4-C5-C6-O6
4	H	5004	GLP	O5-C5-C6-O6

There are no ring outliers.

1 monomer is involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	E	5001	GLP	2	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 GLP R 5003

Bond lengths

Bond angles

Torsions

Rings

Ligand GLP E 5001

Bond lengths

Bond angles

Torsions

Rings

Ligand GLP H 5004

Bond lengths

Bond angles

Torsions

Rings

Ligand GLP Q 5002

Bond lengths

Bond angles

Torsions

Rings
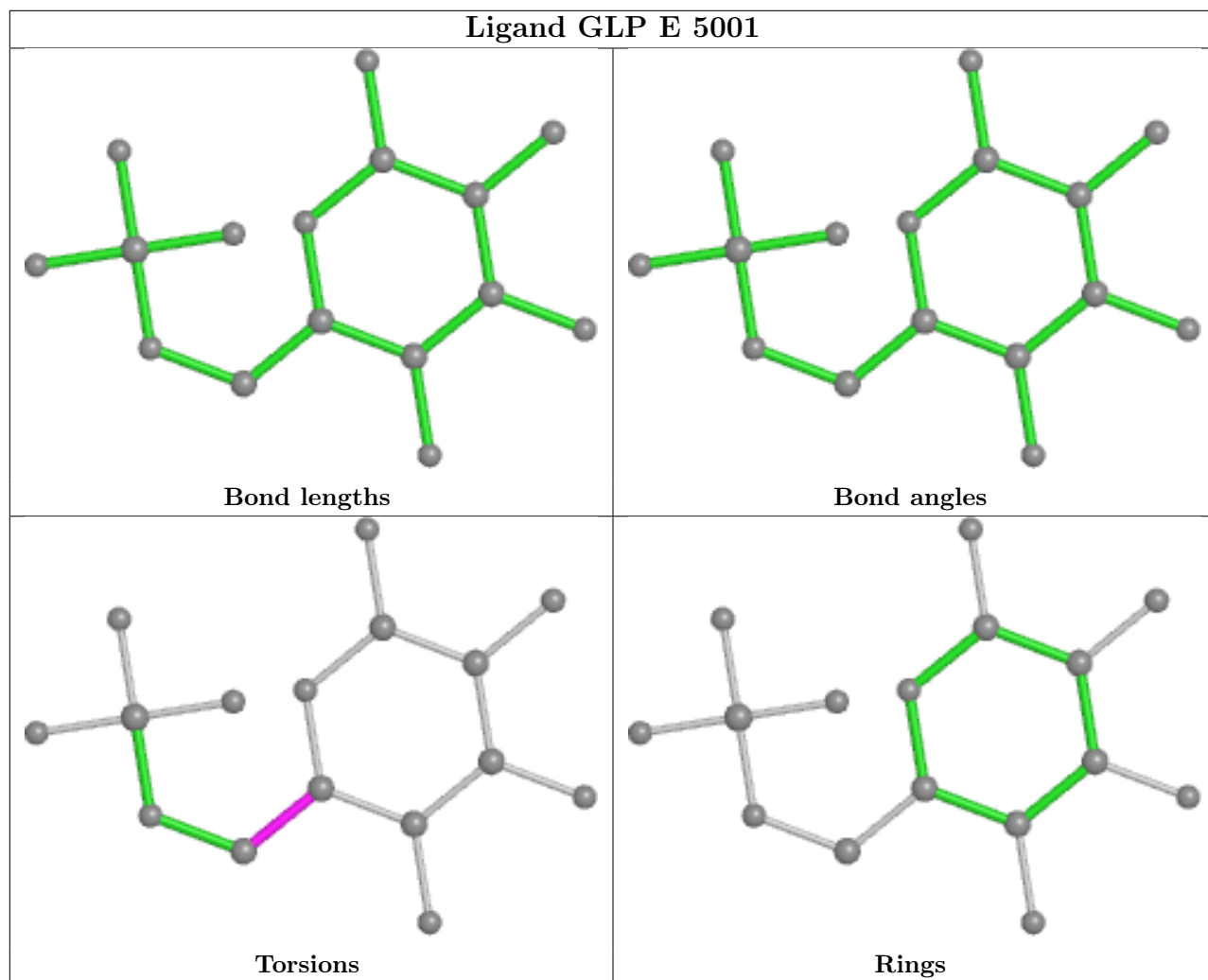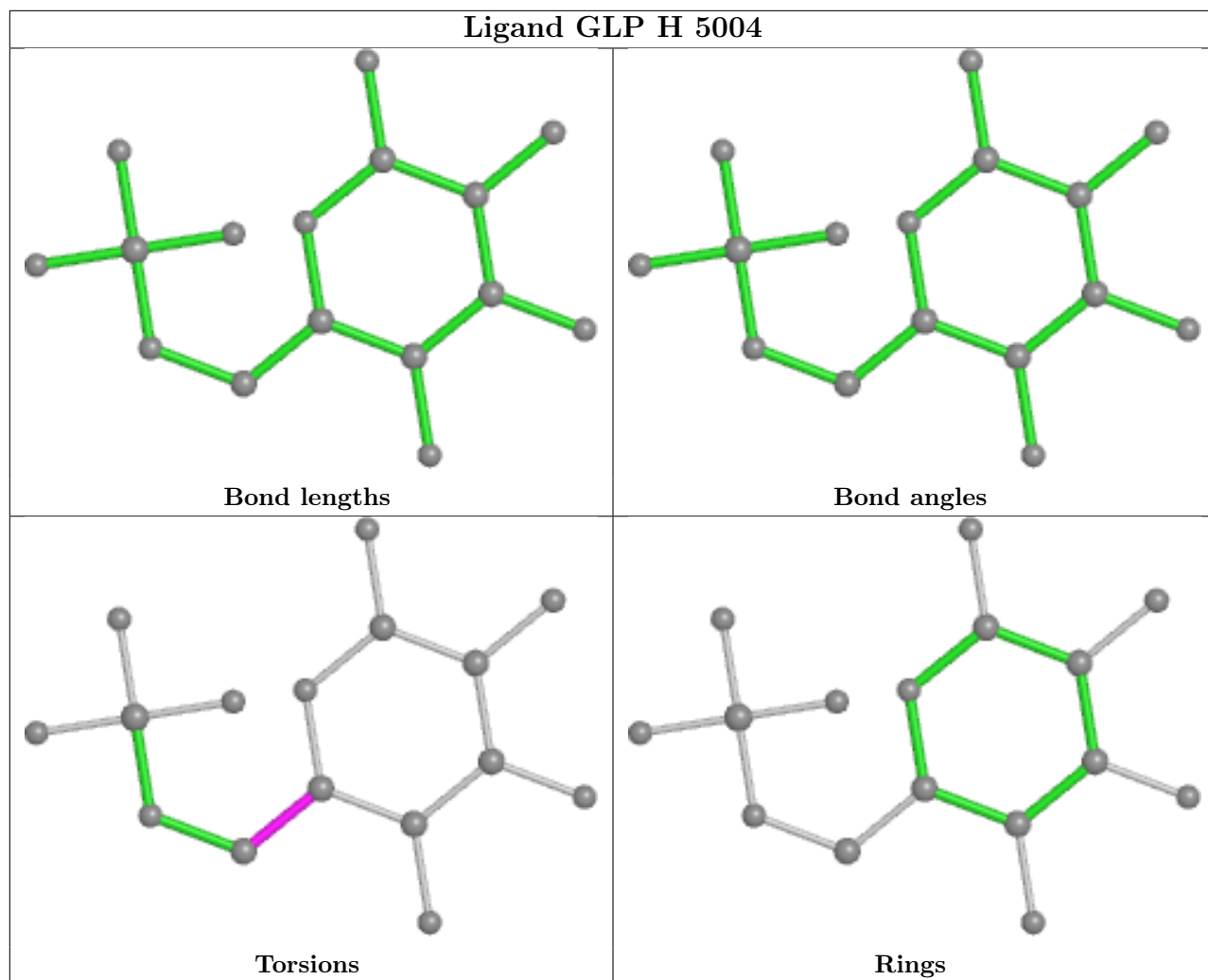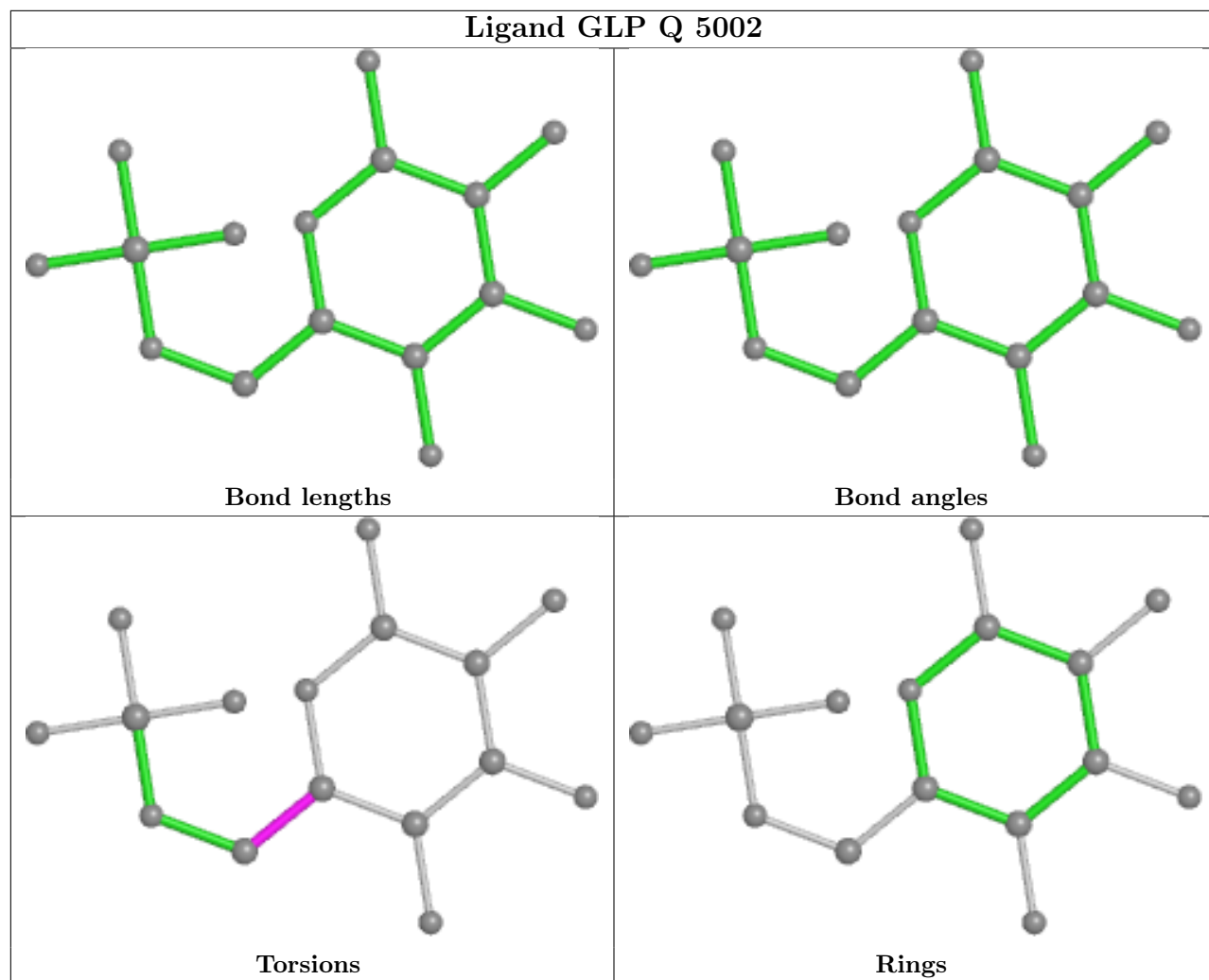
5.7 Other polymers ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

There are no chain breaks in this entry.

6 Fit of model and data ⓘ

6.1 Protein, DNA and RNA chains ⓘ

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

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2			OWAB(Å²)	Q<0.9
1	A	90/98 (91%)	0.30	1 (1%)	80	56	55, 58, 70, 72	0
1	B	90/98 (91%)	0.40	2 (2%)	62	33	50, 57, 67, 69	0
1	C	90/98 (91%)	0.24	0	100	100	51, 57, 68, 70	0
1	D	88/98 (89%)	0.41	1 (1%)	80	56	56, 60, 69, 71	0
2	E	12/13 (92%)	1.07	2 (16%)	1	0	52, 76, 86, 87	0
2	F	12/13 (92%)	0.65	1 (8%)	11	3	32, 46, 59, 69	0
2	G	12/13 (92%)	0.94	2 (16%)	1	0	35, 59, 65, 71	0
2	H	12/13 (92%)	0.96	2 (16%)	1	0	59, 77, 87, 87	0
3	P	140/141 (99%)	0.79	13 (9%)	8	3	57, 78, 106, 116	0
3	Q	140/141 (99%)	0.50	11 (7%)	12	4	31, 57, 105, 123	0
3	R	140/141 (99%)	0.50	7 (5%)	28	10	36, 59, 98, 107	0
3	S	140/141 (99%)	0.81	10 (7%)	16	5	58, 80, 106, 115	0
All	All	966/1008 (95%)	0.55	52 (5%)	25	9	31, 61, 98, 123	0

The worst 5 of 52 RSRZ outliers are listed below:

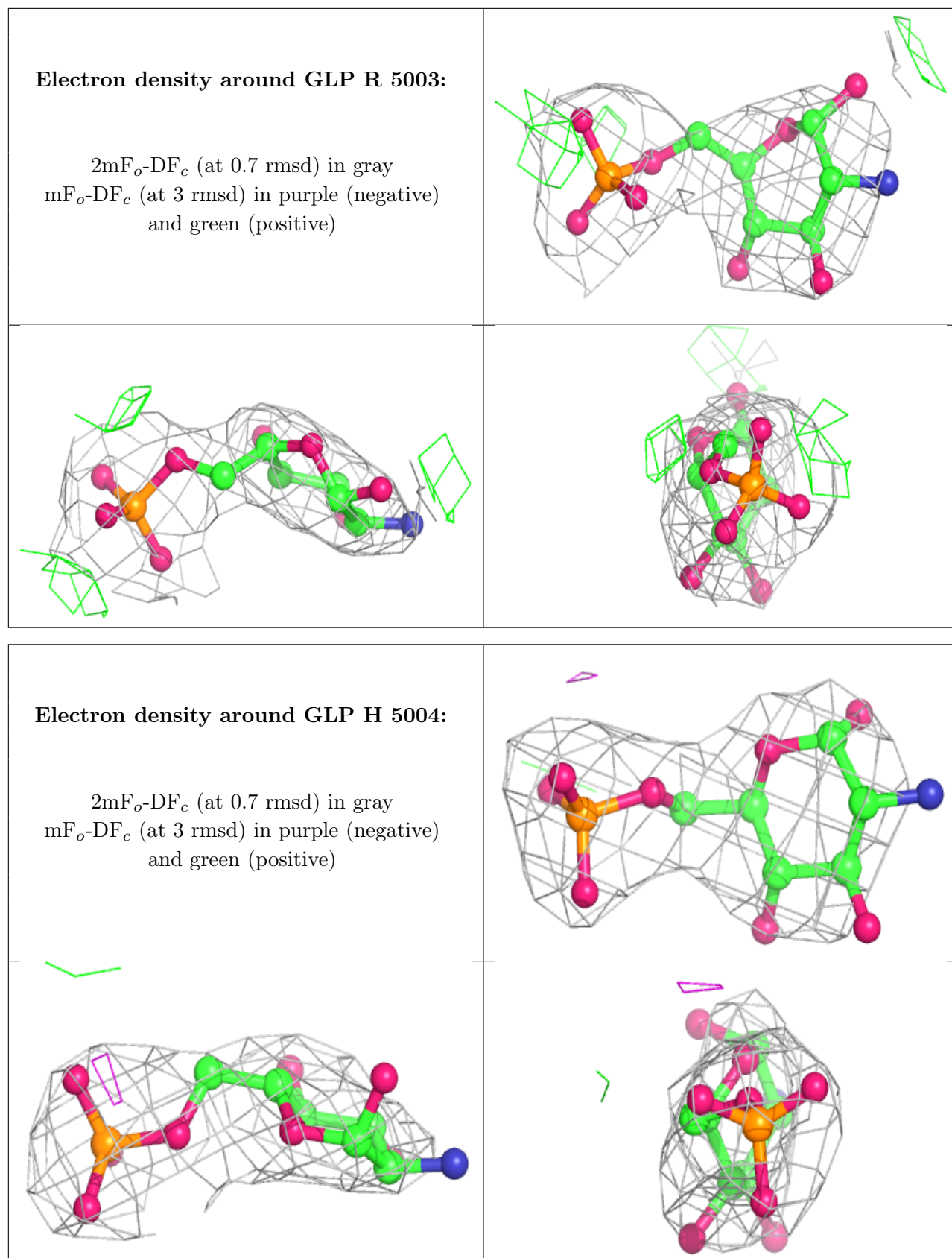| Mol	Chain	Res	Type	RSRZ
3	P	72	U	4.6
3	P	73	U	4.1
3	Q	139	U	3.9
2	G	6	A	3.5
2	F	6	A	3.4

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

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
3	GTP	P	12	32/32	0.76	0.30	95,96,103,103	0
3	GTP	R	12	32/32	0.76	0.26	70,72,83,83	0
2	A2M	H	0	23/24	0.77	0.33	60,61,63,64	0
3	GTP	S	12	32/32	0.78	0.32	94,95,102,102	0
2	A2M	G	0	23/24	0.86	0.28	43,44,55,55	0
3	GTP	Q	12	32/32	0.86	0.24	43,51,65,65	0
2	A2M	F	0	23/24	0.87	0.23	42,43,54,54	0
2	A2M	E	0	23/24	0.90	0.26	55,56,58,58	0

6.3 Carbohydrates ⓘ

There are no monosaccharides in this entry.

6.4 Ligands ⓘ

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
5	MG	F	13	1/1	0.85	0.27	35,35,35,35	0
5	MG	P	9	1/1	0.88	0.37	35,35,35,35	0
4	GLP	R	5003	16/16	0.91	0.28	39,41,44,44	0
4	GLP	H	5004	16/16	0.91	0.32	62,62,63,64	0
5	MG	R	8	1/1	0.91	0.34	38,38,38,38	0
4	GLP	E	5001	16/16	0.92	0.29	55,55,56,56	0
5	MG	F	12	1/1	0.93	0.79	51,51,51,51	0
5	MG	Q	1	1/1	0.94	0.43	40,40,40,40	0
5	MG	R	3	1/1	0.94	0.43	26,26,26,26	0
4	GLP	Q	5002	16/16	0.94	0.22	39,40,41,42	0
5	MG	Q	10	1/1	0.95	0.18	35,35,35,35	0
5	MG	P	6	1/1	0.95	0.28	38,38,38,38	0
5	MG	Q	4	1/1	0.95	0.49	40,40,40,40	0
5	MG	R	5	1/1	0.96	0.44	37,37,37,37	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 GLP R 5003:

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

Electron density around GLP H 5004:

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

Electron density around GLP E 5001:

$2mF_o\text{-}DF_c$ (at 0.7 rmsd) in gray
$mF_o\text{-}DF_c$ (at 3 rmsd) in purple (negative)
and green (positive)
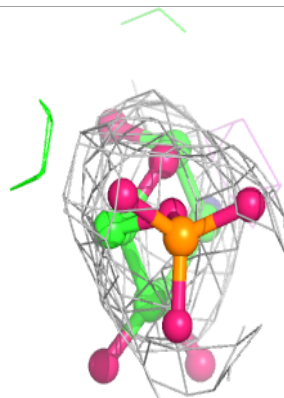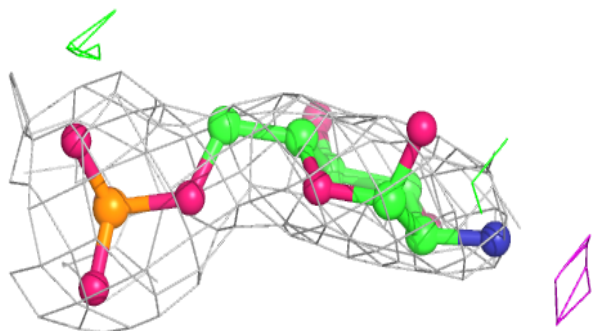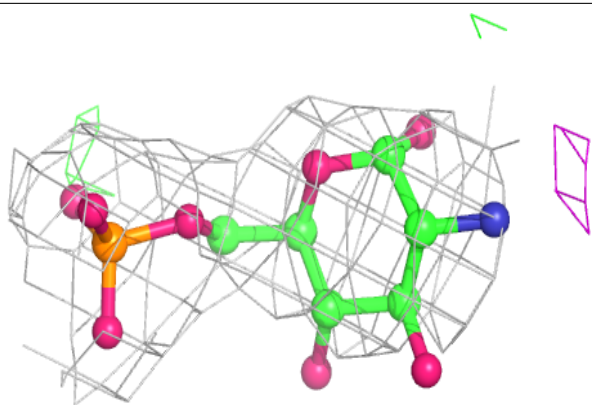
Electron density around GLP Q 5002:

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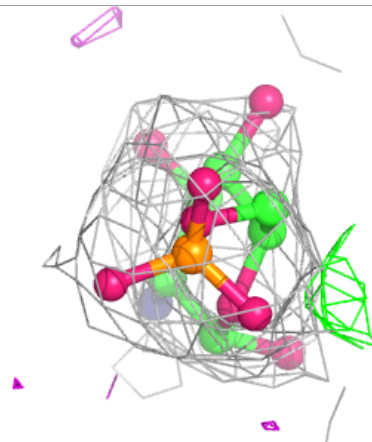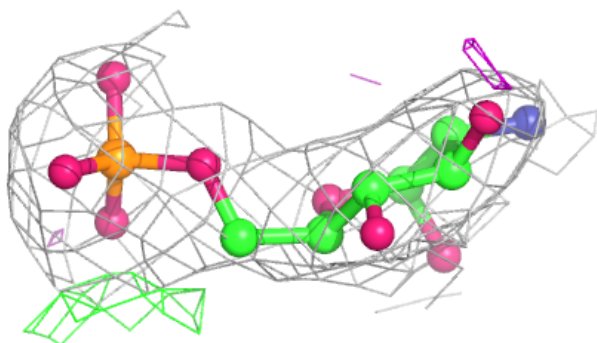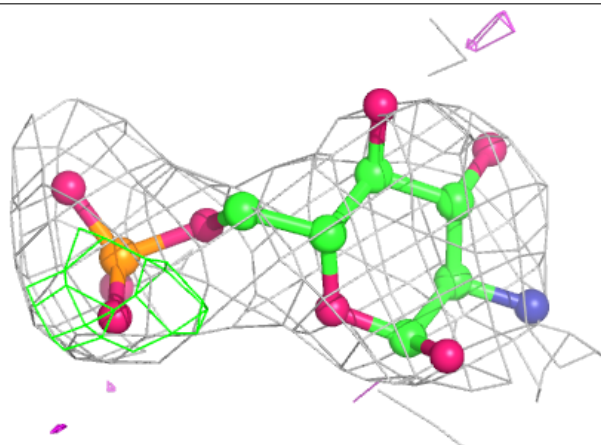
6.5 Other polymers (i)

There are no such residues in this entry.