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

wwPDB X-ray Structure Validation Summary Report ⓘ

Nov 21, 2023 – 05:42 PM JST

PDB ID	:	6JGB
Title	:	Crystal structure of barley exohydrolaseI W286F mutant in complex with methyl 6-thio-beta-gentiobioside
Authors	:	Luang, S.; Streltsov, V.A.; Hrmova, M.
Deposited on	:	2019-02-13
Resolution	:	1.47 Å(reported)

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

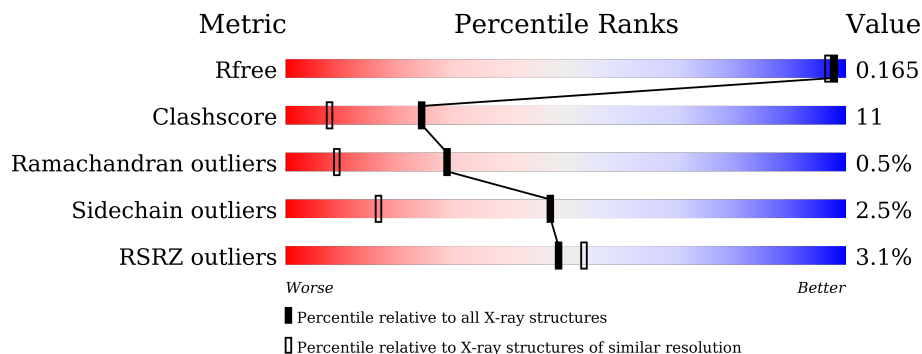|		
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.36
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.36

1   Overall quality at a glance ⓘ

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

The reported resolution of this entry is 1.47 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		0.165
Clashscore		11
Ramachandran outliers		0.5%
Sidechain outliers		2.5%
RSRZ outliers		3.1%

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	4690 (1.50-1.46)
Clashscore	141614	4955 (1.50-1.46)
Ramachandran outliers	138981	4846 (1.50-1.46)
Sidechain outliers	138945	4844 (1.50-1.46)
RSRZ outliers	127900	4614 (1.50-1.46)

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	609	3% 79% 18% •
2	B	2	100%

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
6	1PE	A	720	-	X	-	-
6	1PE	A	722	-	X	-	-

2 Entry composition ⓘ

There are 8 unique types of molecules in this entry. The entry contains 5481 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 BETA-D-GLUCAN GLUCOHYDROLASE ISOENZYME EXO1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	606	Total 4621	C 2921	N 801	O 871	S 28	0	19	0

There are 6 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-3	HIS	-	expression tag	UNP A0A287SCR5
A	-2	HIS	-	expression tag	UNP A0A287SCR5
A	-1	ALA	-	expression tag	UNP A0A287SCR5
A	0	ALA	-	expression tag	UNP A0A287SCR5
A	286	PHE	TRP	engineered mutation	UNP A0A287SCR5
A	320	LYS	ASN	conflict	UNP A0A287SCR5

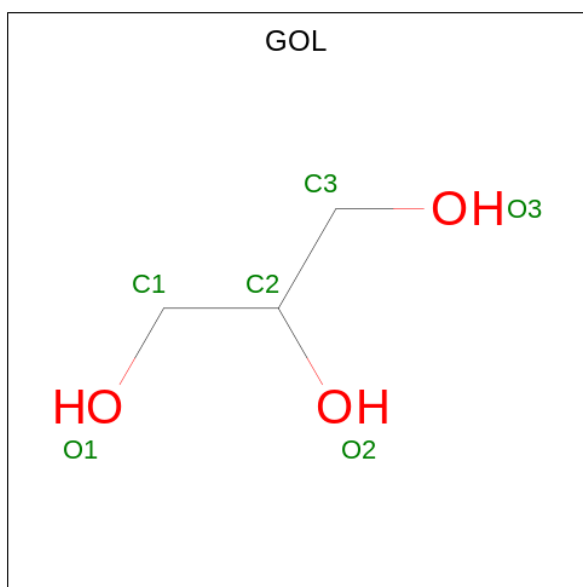- Molecule 2 is an oligosaccharide called beta-D-glucopyranose-(1-6)-methyl 6-thio-beta-D-glucopyranoside.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
2	B	2	Total 24	C 13	O 10	S 1	0	0	0

- Molecule 3 is 2-acetamido-2-deoxy-beta-D-glucopyranose (three-letter code: NAG) (formula: $C_8H_{15}NO_6$).

NAG

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
3	A	1	Total	C	N	O	0	0
			14	8	1	5		
3	A	1	Total	C	N	O	0	0
			14	8	1	5		
3	A	1	Total	C	N	O	0	0
			14	8	1	5		

- Molecule 4 is GLYCEROL (three-letter code: GOL) (formula: $C_3H_8O_3$).

GOL

Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	A	1	Total	C	O	0	0
			6	3	3		

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Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
4	A	1	Total 6	C 3	O 3		0	0
4	A	1	Total 6	C 3	O 3		0	0
4	A	1	Total 6	C 3	O 3		0	0
4	A	1	Total 6	C 3	O 3		0	0

- Molecule 5 is SULFATE ION (three-letter code: SO4) (formula: O_4S).
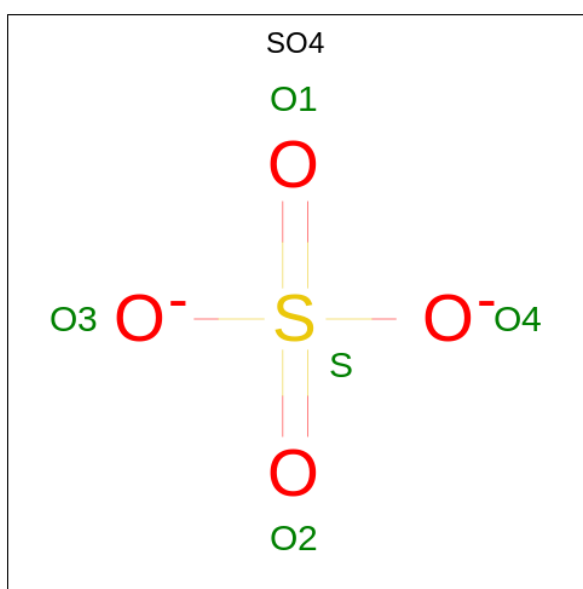
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	A	1	Total 5	O 4	S 1	0	0

- Molecule 6 is PENTAETHYLENE GLYCOL (three-letter code: 1PE) (formula: $C_{10}H_{22}O_6$) (labeled as "Ligand of Interest" by depositor).

Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
6	A	1	Total 5	C 3	O 2	0	0
6	A	1	Total 5	C 3	O 2	0	0
6	A	1	Total 10	C 6	O 4	0	0
6	A	1	Total 7	C 4	O 3	0	0
6	A	1	Total 5	C 3	O 2	0	0
6	A	1	Total 8	C 5	O 3	0	0
6	A	1	Total 8	C 5	O 3	0	0
6	A	1	Total 5	C 3	O 2	0	0
6	A	1	Total 6	C 4	O 2	0	0
6	A	1	Total 7	C 4	O 3	0	0
6	A	1	Total 5	C 3	O 2	0	0
6	A	1	Total 7	C 4	O 3	0	0
6	A	1	Total 4	C 2	O 2	0	0
6	A	1	Total 5	C 3	O 2	0	0

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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
6	A	1	Total 4	C 2	O 2	0	0
6	A	1	Total 5	C 3	O 2	0	0

- Molecule 7 is ACETATE ION (three-letter code: ACT) (formula: $C_2H_3O_2$).
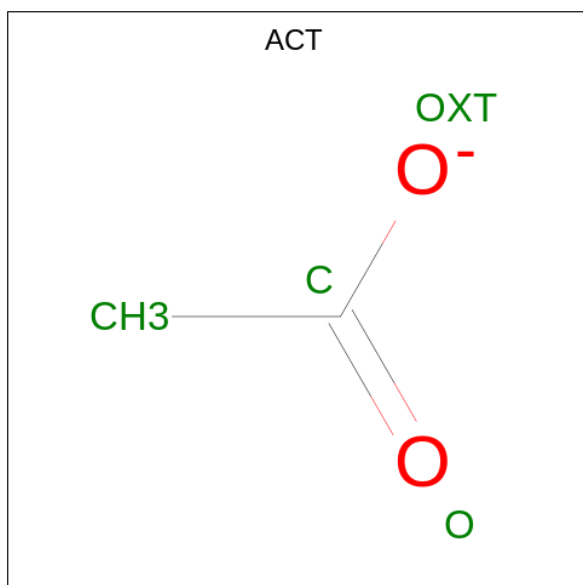
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
7	A	1	Total 4	C 2	O 2	0	0
7	A	1	Total 4	C 2	O 2	0	0
7	A	1	Total 4	C 2	O 2	0	0
7	A	1	Total 4	C 2	O 2	0	0
7	A	1	Total 4	C 2	O 2	0	0
7	A	1	Total 4	C 2	O 2	0	0
7	A	1	Total 4	C 2	O 2	0	0
7	A	1	Total 4	C 2	O 2	0	0

- Molecule 8 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
8	A	631	Total 631	O 631	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: BETA-D-GLUCAN GLUCOHYDROLASE ISOENZYME EXO1
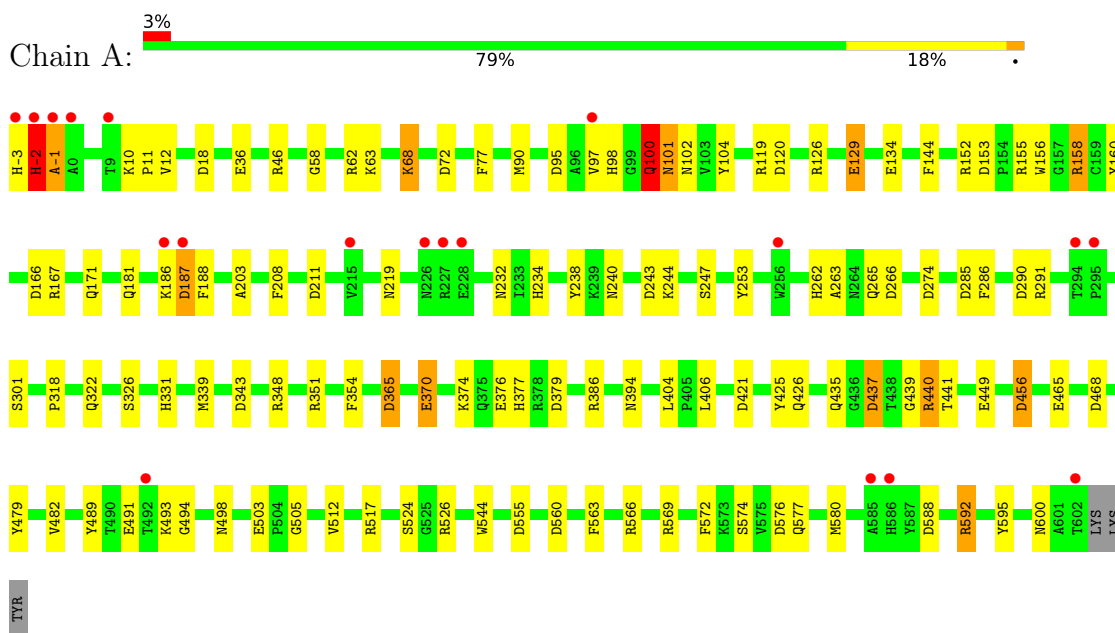
• Molecule 2: beta-D-glucopyranose-(1-6)-methyl 6-thio-beta-D-glucopyranoside

4 Data and refinement statistics ⓘ

Property	Value	Source
Space group	P 43 21 2	Depositor
Cell constants a, b, c, α, β, γ	100.83Å 100.83Å 181.09Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	40.40 – 1.47 40.36 – 1.47	Depositor EDS
% Data completeness (in resolution range)	99.5 (40.40-1.47) 99.5 (40.36-1.47)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.47 (at 1.47Å)	Xtriage
Refinement program	REFMAC 5.7.0029	Depositor
R, R_{free}	0.146 , 0.163 0.149 , 0.165	Depositor DCC
R_{free} test set	7903 reflections (5.02%)	wwPDB-VP
Wilson B-factor (Å^2)	18.5	Xtriage
Anisotropy	0.226	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.39 , 49.1	EDS
L-test for twinning[2]	$< |L| > = 0.51, < L^2 > = 0.35$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.98	EDS
Total number of atoms	5481	wwPDB-VP
Average B, all atoms (Å^2)	23.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.39% 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: ACT, SO4, U1Y, NAG, BGC, 1PE, GOL

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	1.33	20/4784 (0.4%)	1.46	78/6491 (1.2%)

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

The worst 5 of 20 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	503	GLU	CD-OE2	13.92	1.41	1.25
1	A	517[A]	ARG	CZ-NH1	11.15	1.47	1.33
1	A	129[A]	GLU	CD-OE1	9.12	1.35	1.25
1	A	595	TYR	CE2-CZ	-8.11	1.28	1.38
1	A	370[A]	GLU	CG-CD	7.46	1.63	1.51

The worst 5 of 78 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	46	ARG	NE-CZ-NH2	18.15	129.38	120.30
1	A	152	ARG	NE-CZ-NH2	14.45	127.52	120.30
1	A	440[A]	ARG	NE-CZ-NH2	-12.56	114.02	120.30
1	A	152	ARG	NE-CZ-NH1	-11.93	114.34	120.30
1	A	351	ARG	NE-CZ-NH1	11.52	126.06	120.30

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	187	ASP	Peptide

5.2 Too-close contacts ⓘ

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	4621	0	4557	82	0
2	B	24	0	8	0	0
3	A	42	0	39	6	0
4	A	30	0	40	3	0
5	A	5	0	0	0	0
6	A	96	0	110	44	0
7	A	32	0	24	0	0
8	A	631	0	0	33	0
All	All	5481	0	4778	106	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 11.

The worst 5 of 106 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:A:498:ASN:HD21	3:A:703:NAG:C1	0.92	1.53
1:A:600:ASN:HD21	3:A:702:NAG:C1	1.27	1.45
1:A:498:ASN:ND2	3:A:703:NAG:C1	1.76	1.39
1:A:370[B]:GLU:CD	8:A:801:HOH:O	1.73	1.25
1:A:600:ASN:ND2	3:A:702:NAG:C1	2.00	1.21

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	615/609 (101%)	594 (97%)	18 (3%)	3 (0%)	29	9

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	505	GLY
1	A	-1	ALA
1	A	-2	HIS

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	498/490 (102%)	484 (97%)	14 (3%)	43	13

5 of 14 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	100	GLN
1	A	186	LYS
1	A	574[B]	SER
1	A	440[A]	ARG
1	A	574[A]	SER

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 17 such sidechains are listed below:

Mol	Chain	Res	Type
1	A	394	ASN
1	A	600	ASN
1	A	181	GLN
1	A	219	ASN
1	A	234	HIS

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

3 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	NAG	A	701	-	14,14,15	0.80	0	17,19,21	1.77	4 (23%)
3	NAG	A	703	-	14,14,15	1.07	2 (14%)	17,19,21	2.61	9 (52%)
3	NAG	A	702	-	14,14,15	1.02	1 (7%)	17,19,21	2.03	4 (23%)

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	NAG	A	701	-	-	0/6/23/26	0/1/1/1
3	NAG	A	703	-	-	2/6/23/26	0/1/1/1
3	NAG	A	702	-	-	0/6/23/26	0/1/1/1

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	702	NAG	C2-N2	2.50	1.50	1.46
3	A	703	NAG	C4-C3	2.27	1.58	1.52
3	A	703	NAG	C2-N2	2.05	1.49	1.46

The worst 5 of 17 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	A	703	NAG	O5-C1-C2	4.79	118.86	111.29

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	A	703	NAG	C3-C4-C5	4.55	118.35	110.24
3	A	703	NAG	C4-C3-C2	4.07	116.98	111.02
3	A	702	NAG	C1-O5-C5	-4.04	106.72	112.19
3	A	701	NAG	C2-N2-C7	3.81	128.33	122.90

There are no chirality outliers.

All (2) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	703	NAG	C4-C5-C6-O6
3	A	703	NAG	O5-C5-C6-O6

There are no ring outliers.

2 monomers are involved in 6 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	703	NAG	2	0
3	A	702	NAG	4	0

5.5 Carbohydrates (i)

2 monosaccharides 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	U1Y	B	1	2	13,13,13	0.88	1 (7%)	18,18,18	1.60	2 (11%)
2	BGC	B	2	2	11,11,12	3.93	3 (27%)	15,15,17	3.24	8 (53%)

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	U1Y	B	1	2	-	0/4/24/24	0/1/1/1
2	BGC	B	2	2	-	0/2/19/22	0/1/1/1

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	2	BGC	C2-C3	-11.91	1.35	1.52
2	B	2	BGC	C4-C5	3.18	1.59	1.53
2	B	2	BGC	O5-C1	2.91	1.48	1.43
2	B	1	U1Y	O5-C5	2.01	1.49	1.44

The worst 5 of 10 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	B	2	BGC	C1-C2-C3	8.97	120.69	109.67
2	B	1	U1Y	O1-C1-C2	-5.15	102.12	108.15
2	B	2	BGC	O3-C3-C2	4.53	118.68	109.99
2	B	2	BGC	C2-C3-C4	3.68	117.27	110.89
2	B	2	BGC	C3-C4-C5	-3.51	103.98	110.24

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

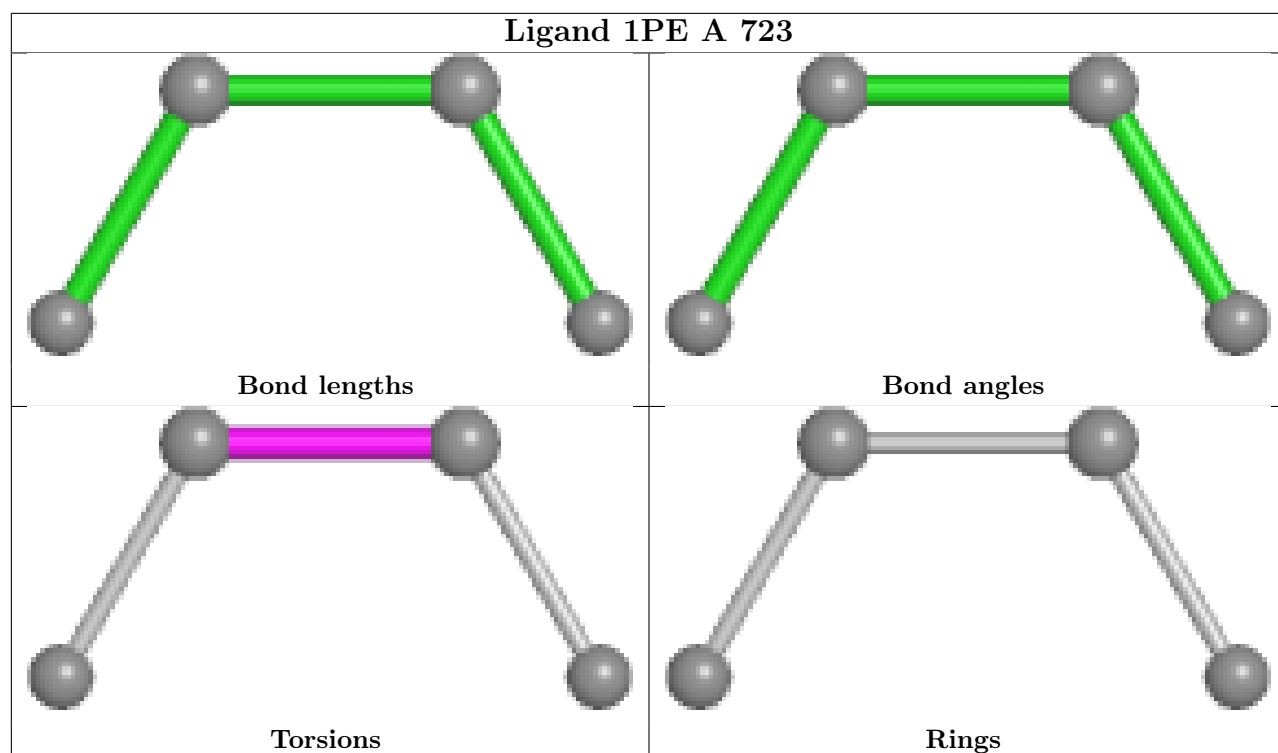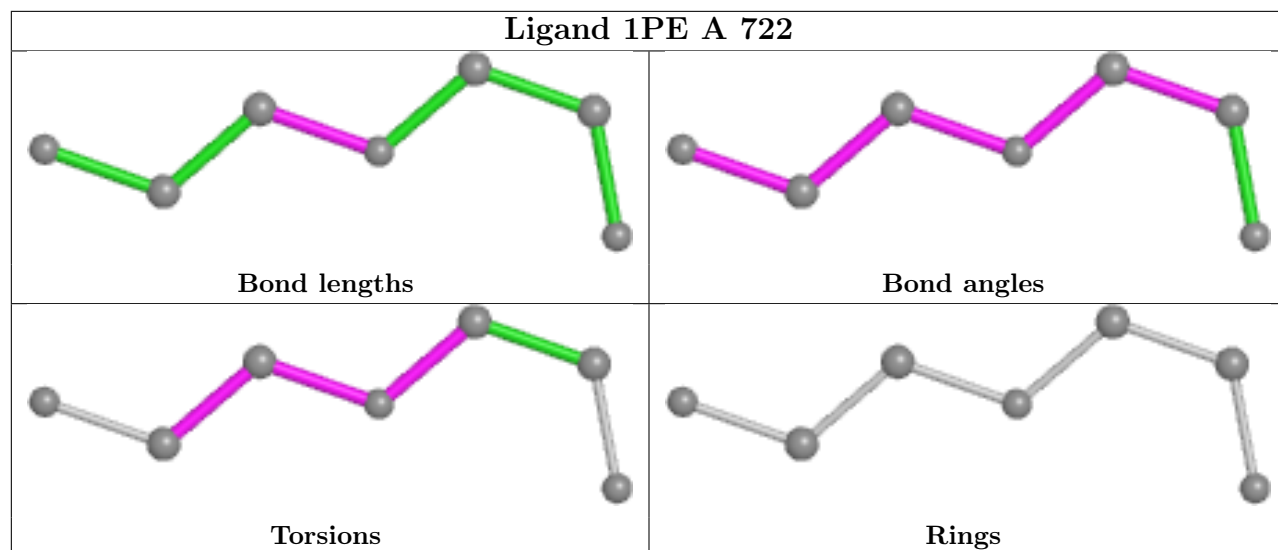The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for oligosaccharide.

Oligosaccharide Chain B

Bond lengths

Bond angles

Torsions

Rings
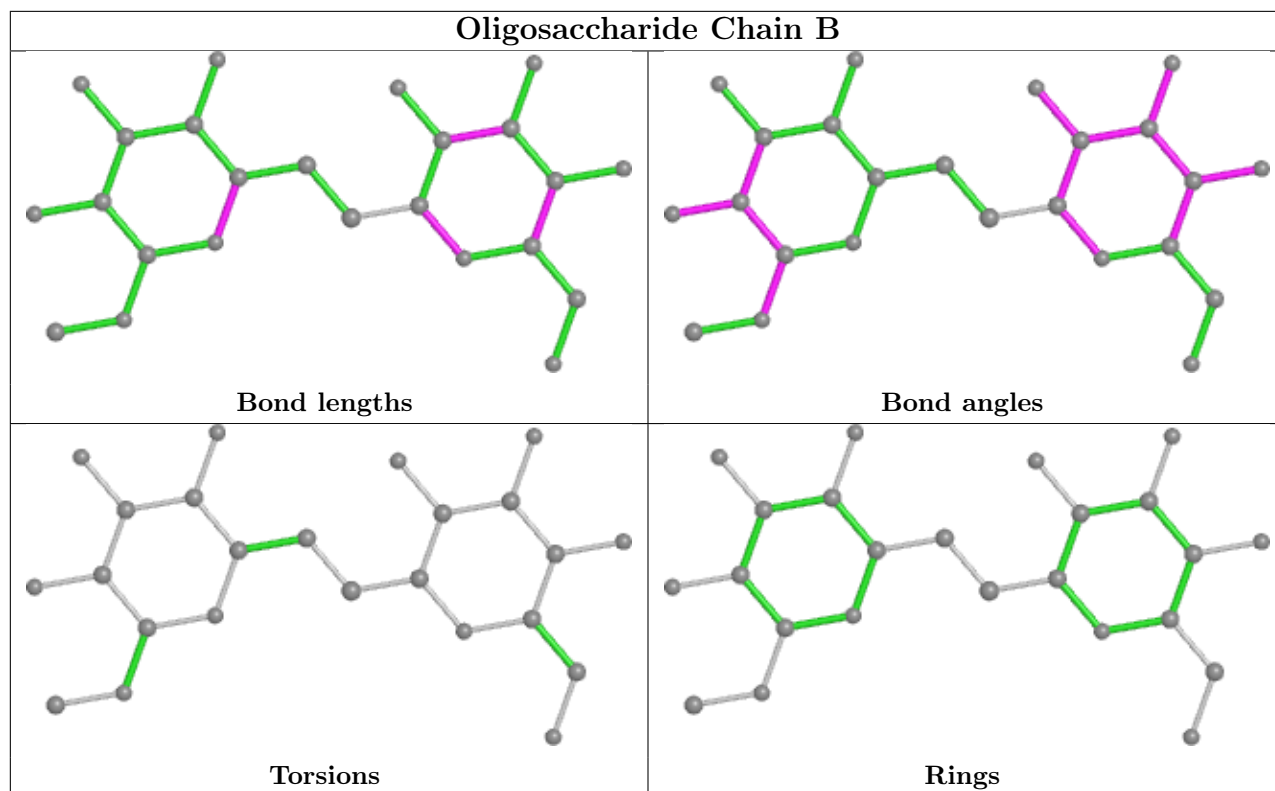
5.6 Ligand geometry ⓘ

33 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).
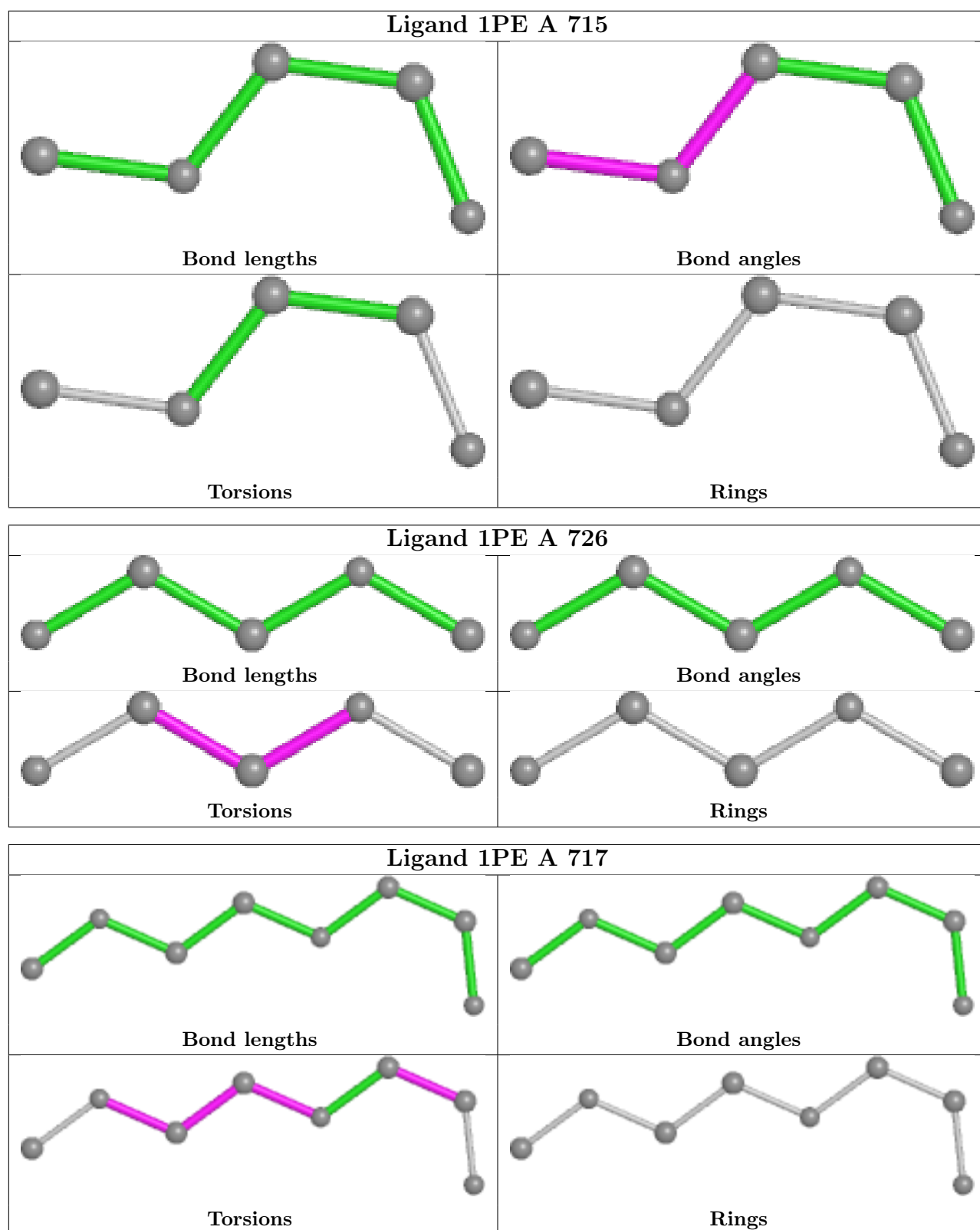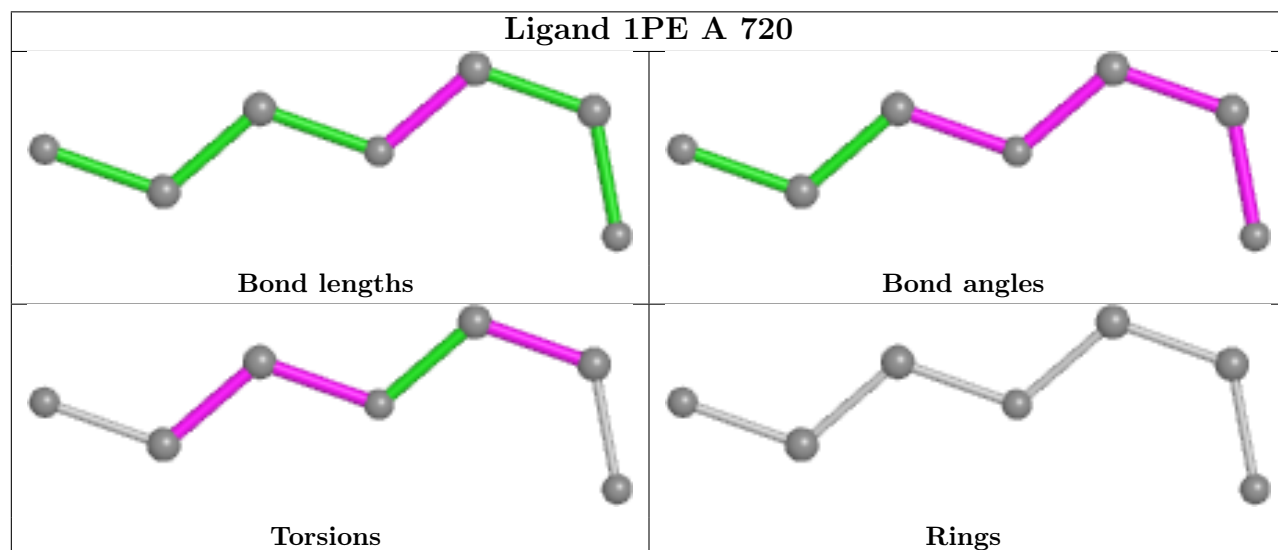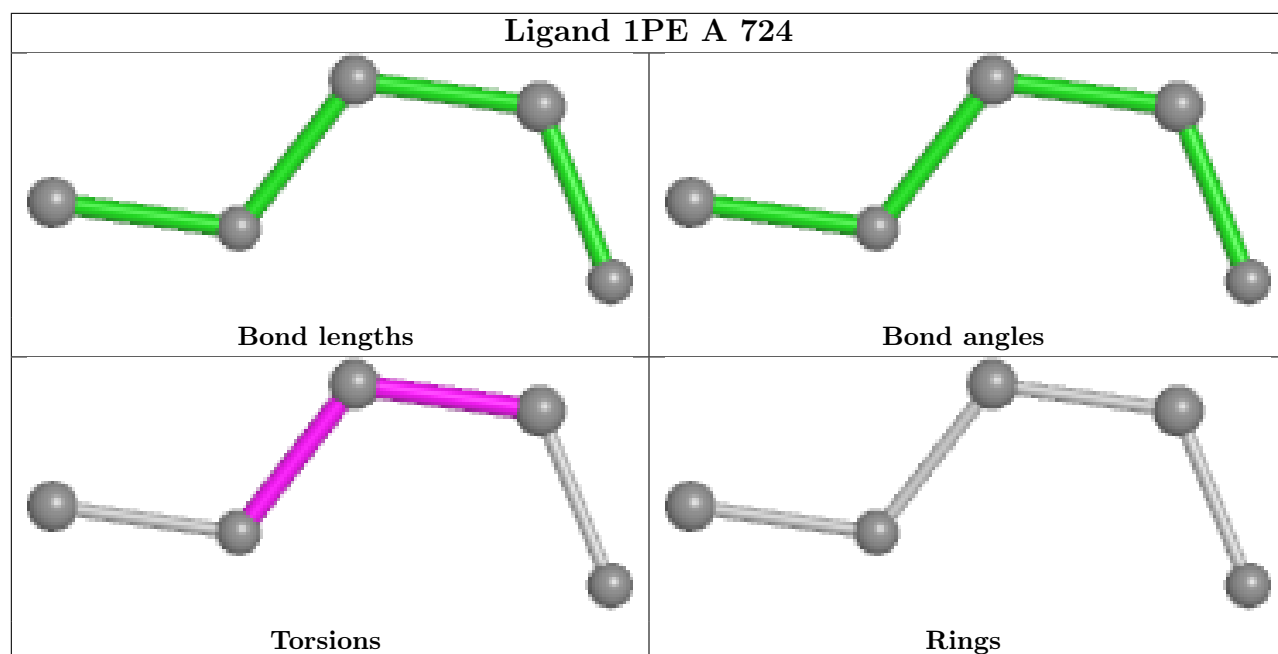
Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	#$|Z| > 2$	Counts	RMSZ	#$|Z| > 2$
6	1PE	A	719	-	5,5,15	0.70	0	4,4,14	1.40	1 (25%)
6	1PE	A	721	-	4,4,15	0.86	0	3,3,14	0.31	0
6	1PE	A	713	-	9,9,15	1.06	0	8,8,14	1.32	0
6	1PE	A	722	-	6,6,15	1.58	1 (16%)	5,5,14	2.47	3 (60%)
6	1PE	A	723	-	3,3,15	1.27	0	2,2,14	0.85	0
7	ACT	A	730	-	3,3,3	0.85	0	3,3,3	1.50	1 (33%)
6	1PE	A	725	-	3,3,15	1.02	0	2,2,14	0.81	0
6	1PE	A	718	-	4,4,15	0.50	0	3,3,14	0.66	0
5	SO4	A	710	-	4,4,4	0.66	0	6,6,6	2.02	2 (33%)
7	ACT	A	728	-	3,3,3	0.83	0	3,3,3	1.30	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	#|Z| > 2	Counts	RMSZ	#|Z| > 2
7	ACT	A	733	-	3,3,3	1.09	0	3,3,3	0.31	0
6	1PE	A	715	-	4,4,15	0.65	0	3,3,14	1.34	1 (33%)
7	ACT	A	727	-	3,3,3	0.76	0	3,3,3	1.29	0
6	1PE	A	726	-	4,4,15	1.11	0	3,3,14	1.05	0
6	1PE	A	717	-	7,7,15	0.96	0	6,6,14	1.23	0
3	NAG	A	701	-	14,14,15	0.80	0	17,19,21	1.77	4 (23%)
7	ACT	A	732	-	3,3,3	0.80	0	3,3,3	0.98	0
6	1PE	A	716	-	7,7,15	1.02	0	6,6,14	1.53	1 (16%)
4	GOL	A	705	-	5,5,5	0.58	0	5,5,5	0.93	0
4	GOL	A	707	-	5,5,5	0.75	0	5,5,5	1.37	1 (20%)
7	ACT	A	731	-	3,3,3	0.87	0	3,3,3	0.51	0
6	1PE	A	724	-	4,4,15	0.79	0	3,3,14	0.70	0
4	GOL	A	709	-	5,5,5	1.27	1 (20%)	5,5,5	2.12	2 (40%)
3	NAG	A	702	-	14,14,15	1.02	1 (7%)	17,19,21	2.03	4 (23%)
6	1PE	A	720	-	6,6,15	1.47	1 (16%)	5,5,14	1.69	2 (40%)
7	ACT	A	729	-	3,3,3	0.93	0	3,3,3	0.85	0
6	1PE	A	712	-	4,4,15	1.34	0	3,3,14	0.70	0
4	GOL	A	708	-	5,5,5	0.76	0	5,5,5	0.73	0
7	ACT	A	734	-	3,3,3	1.01	0	3,3,3	0.59	0
3	NAG	A	703	-	14,14,15	1.07	2 (14%)	17,19,21	2.61	9 (52%)
6	1PE	A	714	-	6,6,15	0.61	0	5,5,14	0.59	0
6	1PE	A	711	-	4,4,15	0.60	0	3,3,14	0.54	0
4	GOL	A	706	-	5,5,5	0.55	0	5,5,5	1.72	1 (20%)

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
6	1PE	A	719	-	-	2/3/3/13	-
6	1PE	A	721	-	-	2/2/2/13	-
6	1PE	A	713	-	-	5/7/7/13	-
6	1PE	A	722	-	-	3/4/4/13	-
6	1PE	A	723	-	-	1/1/1/13	-
6	1PE	A	725	-	-	1/1/1/13	-
6	1PE	A	718	-	-	0/2/2/13	-
6	1PE	A	715	-	-	0/2/2/13	-
6	1PE	A	726	-	-	2/2/2/13	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
6	1PE	A	717	-	-	4/5/5/13	-
3	NAG	A	701	-	-	0/6/23/26	0/1/1/1
6	1PE	A	716	-	-	3/5/5/13	-
4	GOL	A	705	-	-	2/4/4/4	-
4	GOL	A	707	-	-	4/4/4/4	-
6	1PE	A	724	-	-	2/2/2/13	-
4	GOL	A	709	-	-	2/4/4/4	-
3	NAG	A	702	-	-	0/6/23/26	0/1/1/1
6	1PE	A	720	-	-	3/4/4/13	-
6	1PE	A	712	-	-	1/2/2/13	-
4	GOL	A	708	-	-	4/4/4/4	-
3	NAG	A	703	-	-	2/6/23/26	0/1/1/1
6	1PE	A	714	-	-	2/4/4/13	-
6	1PE	A	711	-	-	2/2/2/13	-
4	GOL	A	706	-	-	2/4/4/4	-

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

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	A	722	1PE	OH3-C23	2.76	1.54	1.42
6	A	720	1PE	OH3-C22	2.53	1.53	1.42
3	A	702	NAG	C2-N2	2.50	1.50	1.46
3	A	703	NAG	C4-C3	2.27	1.58	1.52
4	A	709	GOL	C1-C2	-2.14	1.42	1.51

The worst 5 of 32 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	703	NAG	O5-C1-C2	4.79	118.86	111.29
3	A	703	NAG	C3-C4-C5	4.55	118.35	110.24
3	A	703	NAG	C4-C3-C2	4.07	116.98	111.02
3	A	702	NAG	C1-O5-C5	-4.04	106.72	112.19
3	A	701	NAG	C2-N2-C7	3.81	128.33	122.90

There are no chirality outliers.

5 of 49 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	A	706	GOL	C1-C2-C3-O3

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Mol	Chain	Res	Type	Atoms
4	A	707	GOL	O1-C1-C2-C3
4	A	707	GOL	C1-C2-C3-O3
4	A	708	GOL	O1-C1-C2-C3
4	A	708	GOL	C1-C2-C3-O3

There are no ring outliers.

15 monomers are involved in 53 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
6	A	719	1PE	4	0
6	A	721	1PE	2	0
6	A	713	1PE	2	0
6	A	722	1PE	6	0
6	A	725	1PE	3	0
6	A	718	1PE	1	0
6	A	715	1PE	5	0
6	A	726	1PE	4	0
6	A	717	1PE	4	0
6	A	716	1PE	6	0
4	A	709	GOL	3	0
3	A	702	NAG	4	0
6	A	720	1PE	5	0
3	A	703	NAG	2	0
6	A	711	1PE	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 1PE A 719

Bond lengths

Bond angles

Torsions

Rings

Ligand 1PE A 721

Bond lengths

Bond angles

Torsions

Rings

Ligand 1PE A 713

Bond lengths

Bond angles

Torsions

Rings

Ligand 1PE A 722

Bond lengths

Bond angles

Torsions

Rings

Ligand 1PE A 723

Bond lengths

Bond angles

Torsions

Rings

Ligand 1PE A 725

Bond lengths

Bond angles

Torsions

Rings

Ligand 1PE A 718

Bond lengths

Bond angles

Torsions

Rings

Ligand 1PE A 715

Bond lengths

Bond angles

Torsions

Rings

Ligand 1PE A 726

Bond lengths

Bond angles

Torsions

Rings

Ligand 1PE A 717

Bond lengths

Bond angles

Torsions

Rings

Ligand 1PE A 716

Bond lengths

Bond angles

Torsions

Rings

Ligand 1PE A 724

Bond lengths

Bond angles

Torsions

Rings

Ligand 1PE A 720

Bond lengths

Bond angles

Torsions

Rings

Ligand 1PE A 712

Bond lengths

Bond angles

Torsions

Rings

Ligand 1PE A 714

Bond lengths

Bond angles

Torsions

Rings

Ligand 1PE A 711

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	606/609 (99%)	-0.14	19 (3%)	49	53	13, 19, 33, 80	0

The worst 5 of 19 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	586	HIS	6.7
1	A	585	ALA	5.3
1	A	-2	HIS	5.2
1	A	294	THR	4.7
1	A	187	ASP	4.6

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(Å²)	Q<0.9
3	NAG	A	703	14/15	0.68	0.36	63,86,94,103	0
3	NAG	A	702	14/15	0.69	0.32	51,78,85,87	0
3	NAG	A	701	14/15	0.84	0.29	41,52,69,79	0

6.3 Carbohydrates ⓘ

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	BGC	B	2	11/12	0.96	0.10	13,14,16,17	0
2	U1Y	B	1	13/13	0.98	0.06	15,17,23,28	0

The following is a graphical depiction of the model fit to experimental electron density for oligosaccharide. Each fit is shown from different orientation to approximate a three-dimensional view.
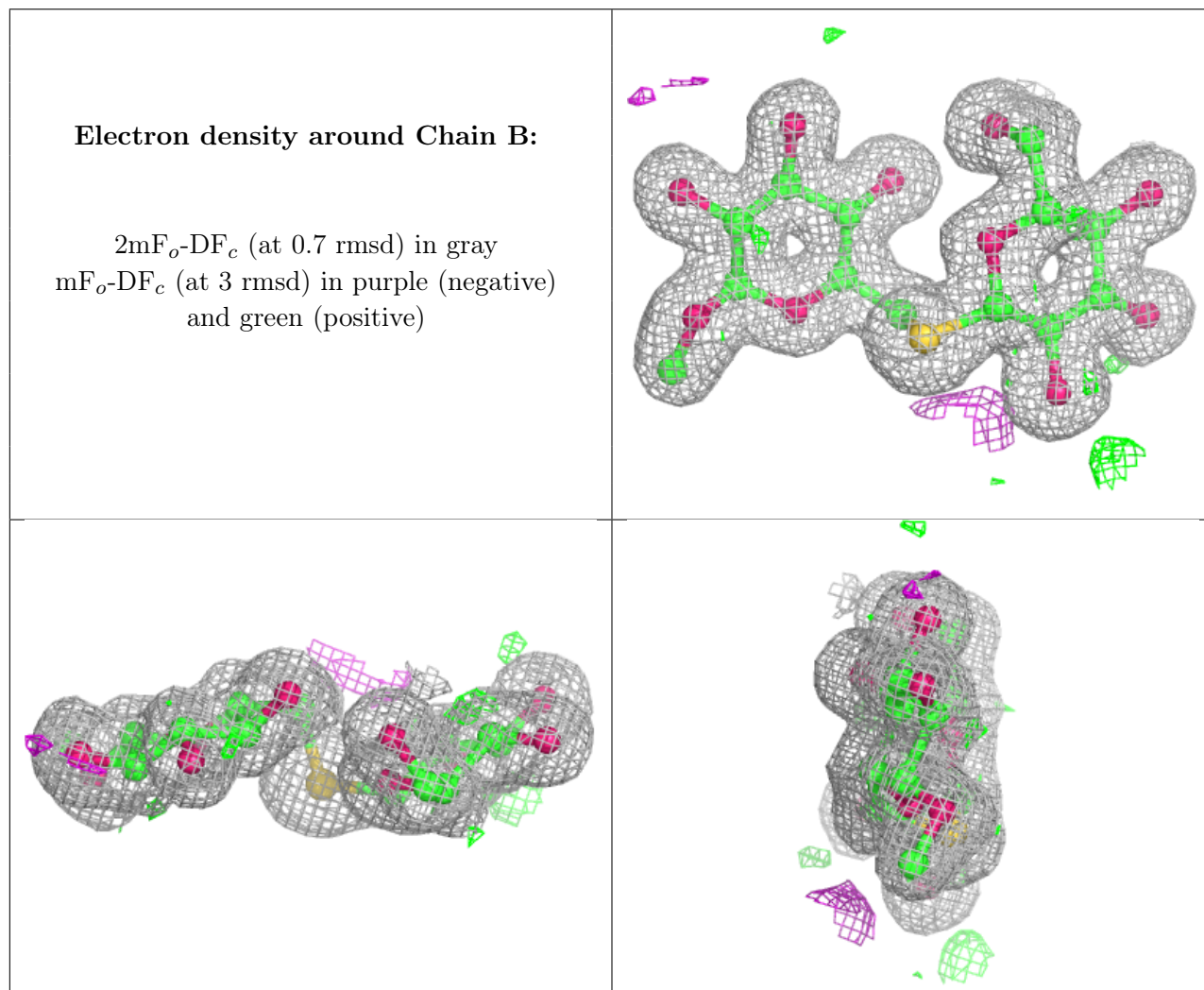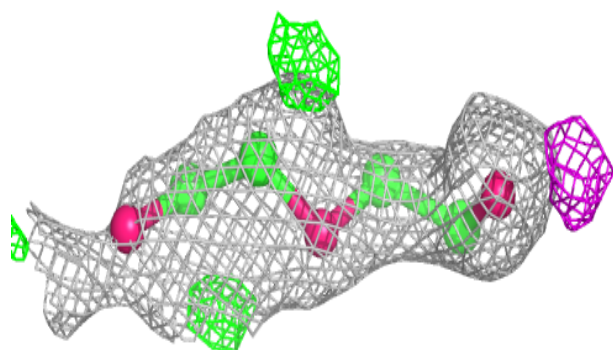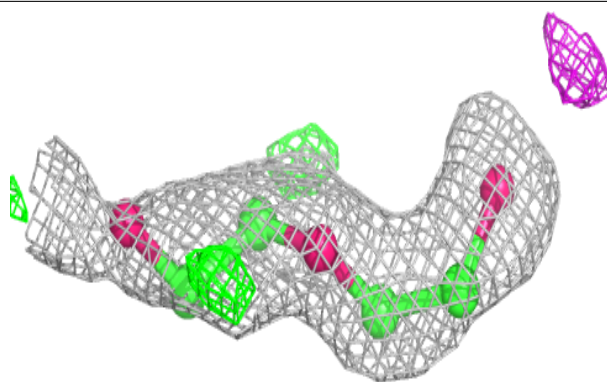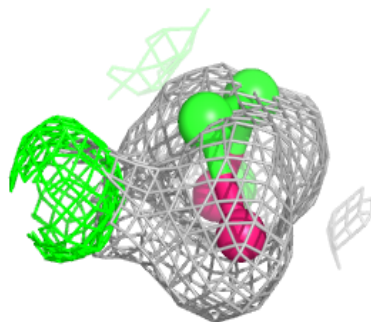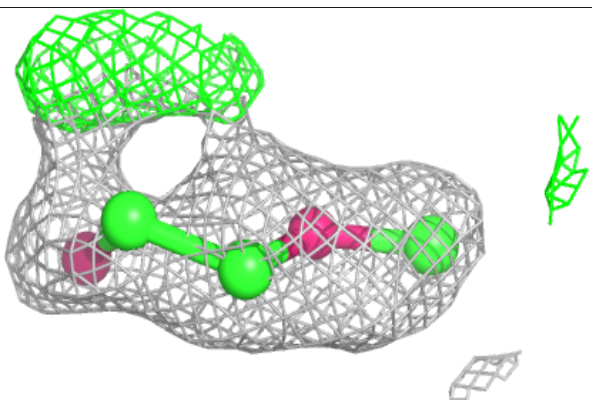

Electron density around Chain B:

2mF$_o$-DF$_c$ (at 0.7 rmsd) in gray
mF$_o$-DF$_c$ (at 3 rmsd) in purple (negative)
and green (positive)

## 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
7	ACT	A	730	4/4	0.51	0.18	65,67,68,72	0
3	NAG	A	703	14/15	0.68	0.36	63,86,94,103	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
3	NAG	A	702	14/15	0.69	0.32	51,78,85,87	0
7	ACT	A	729	4/4	0.73	0.16	55,56,61,62	0
6	1PE	A	724	5/16	0.76	0.14	50,50,55,64	0
6	1PE	A	723	4/16	0.77	0.23	35,49,55,59	0
6	1PE	A	712	5/16	0.79	0.14	36,44,51,57	0
6	1PE	A	722	7/16	0.79	0.21	25,33,39,51	0
7	ACT	A	734	4/4	0.79	0.31	49,64,65,71	0
6	1PE	A	716	8/16	0.80	0.25	43,50,59,63	0
7	ACT	A	732	4/4	0.80	0.30	70,71,72,72	0
6	1PE	A	720	7/16	0.80	0.17	31,43,51,64	0
6	1PE	A	714	7/16	0.82	0.12	46,59,79,82	0
7	ACT	A	733	4/4	0.83	0.14	48,57,57,60	0
6	1PE	A	718	5/16	0.83	0.24	48,55,66,68	0
6	1PE	A	726	5/16	0.84	0.32	49,56,65,66	0
3	NAG	A	701	14/15	0.84	0.29	41,52,69,79	0
6	1PE	A	725	4/16	0.84	0.23	33,40,40,43	0
7	ACT	A	731	4/4	0.86	0.16	65,65,66,78	0
6	1PE	A	711	5/16	0.86	0.24	33,33,56,67	0
7	ACT	A	727	4/4	0.87	0.22	57,57,66,67	0
6	1PE	A	713	10/16	0.88	0.21	28,48,57,64	0
6	1PE	A	717	8/16	0.88	0.29	30,45,51,69	0
6	1PE	A	721	5/16	0.88	0.36	31,35,55,59	0
6	1PE	A	719	6/16	0.89	0.26	37,44,51,66	0
4	GOL	A	708	6/6	0.89	0.23	34,55,57,58	0
4	GOL	A	705	6/6	0.89	0.15	41,50,58,64	0
7	ACT	A	728	4/4	0.91	0.17	63,67,70,74	0
5	SO4	A	710	5/5	0.92	0.12	23,26,34,37	5
6	1PE	A	715	5/16	0.92	0.17	20,40,54,60	0
4	GOL	A	709	6/6	0.92	0.18	20,37,40,41	0
4	GOL	A	707	6/6	0.95	0.12	20,34,37,39	0
4	GOL	A	706	6/6	0.95	0.22	24,40,42,48	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.
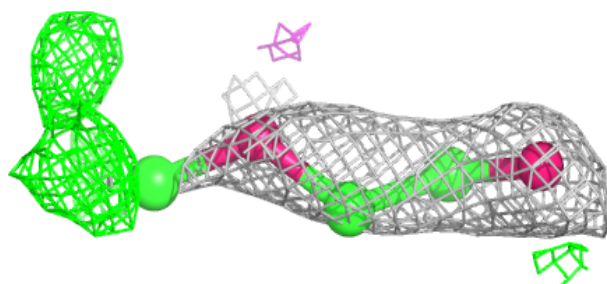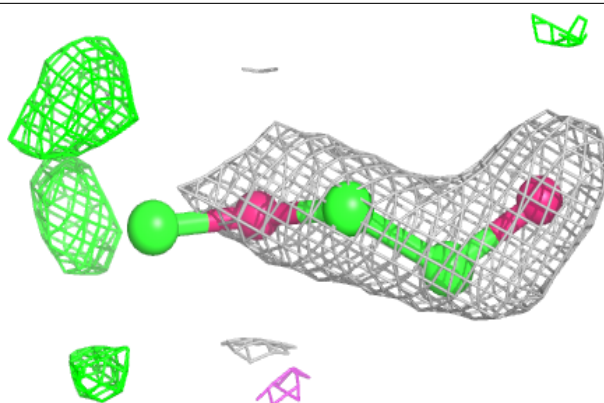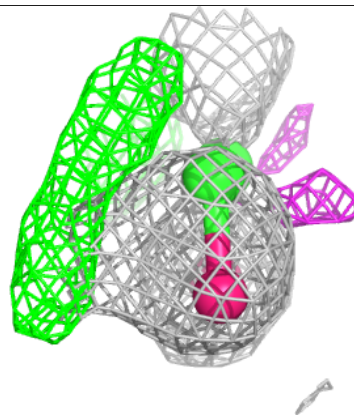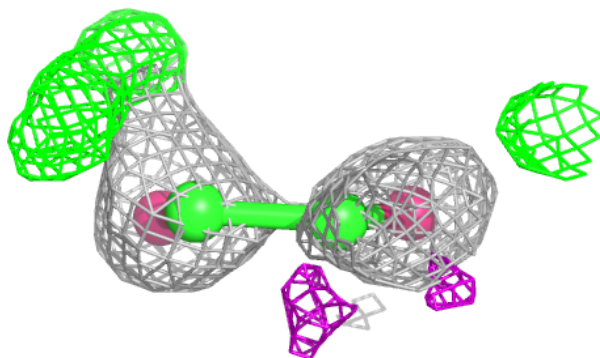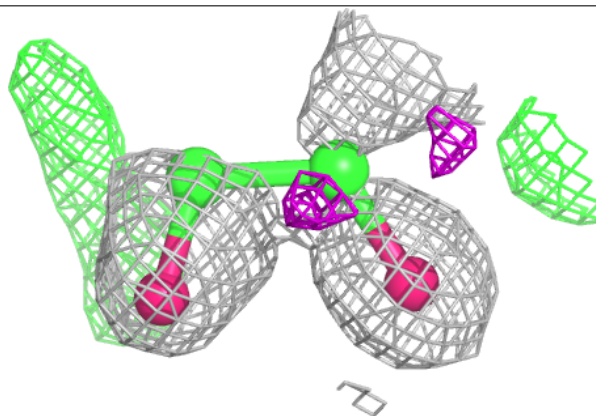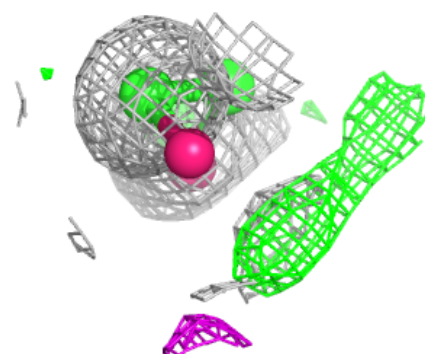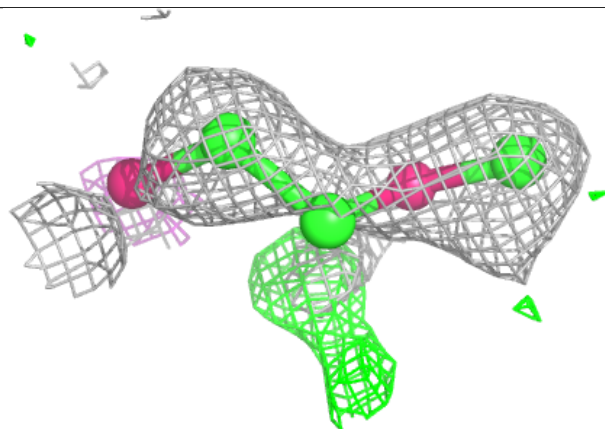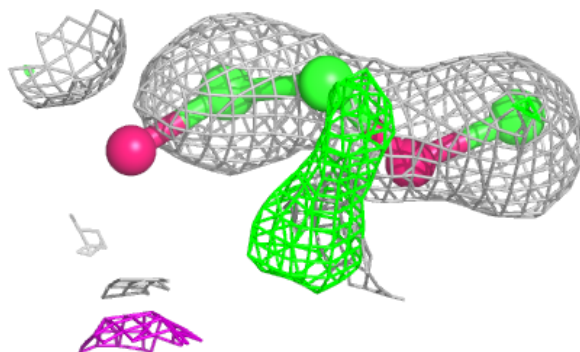
Electron density around 1PE A 724:

2mF$_o$-DF$_c$ (at 0.7 rmsd) in gray
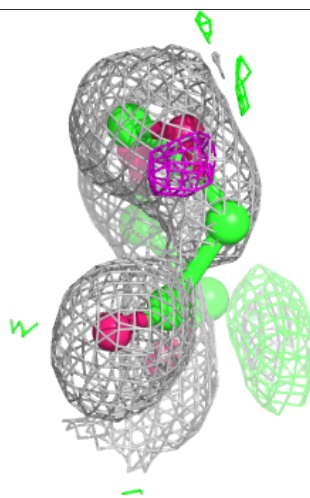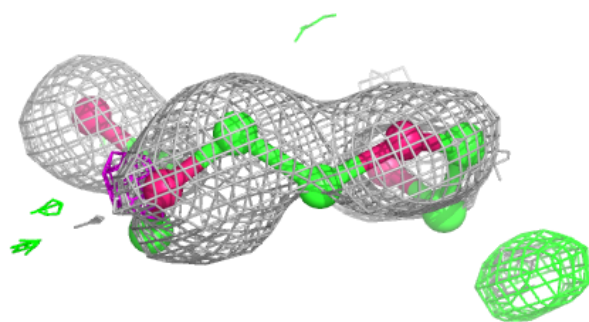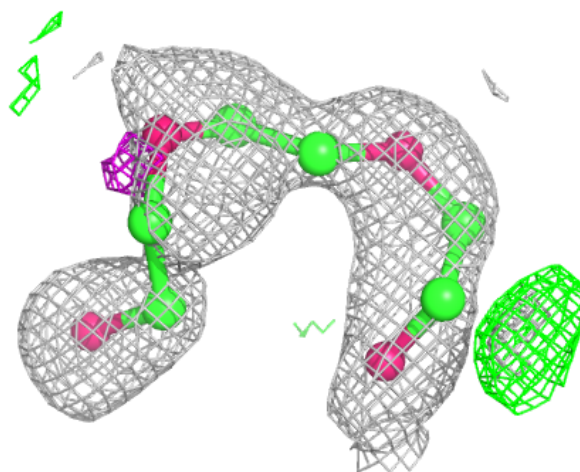mF$_o$-DF$_c$ (at 3 rmsd) in purple (negative)
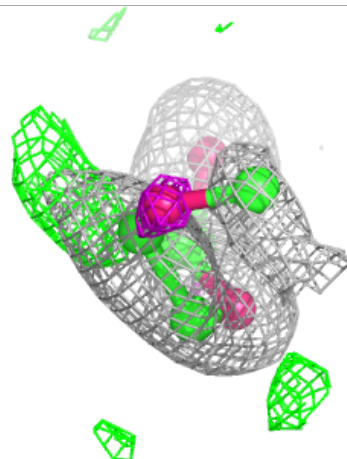and green (positive)
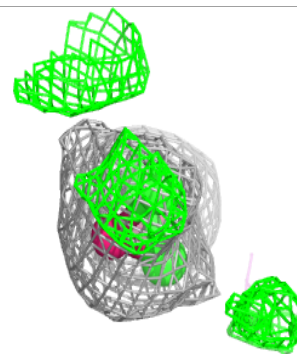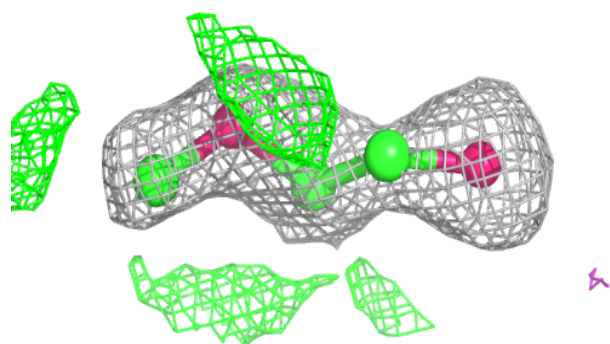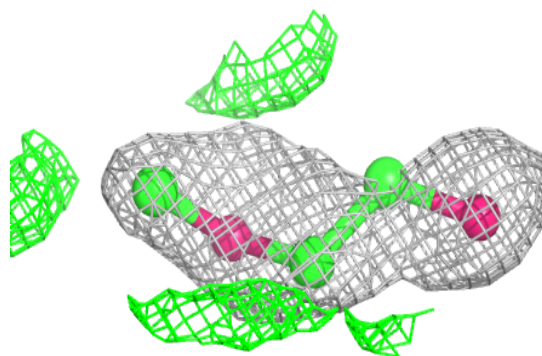
Electron density around 1PE A 723:

2mF$_o$-DF$_c$ (at 0.7 rmsd) in gray
mF$_o$-DF$_c$ (at 3 rmsd) in purple (negative)
and green (positive)
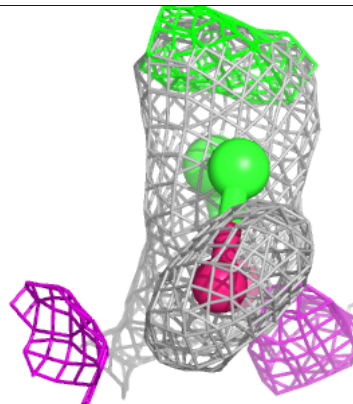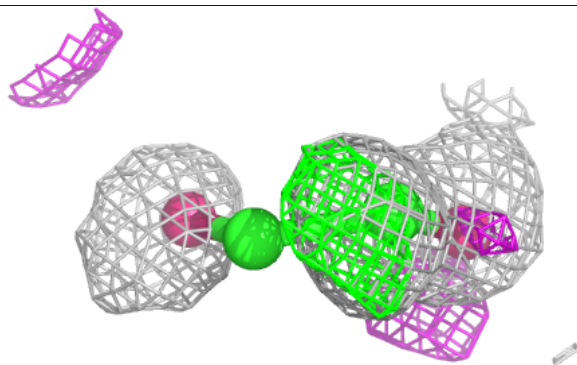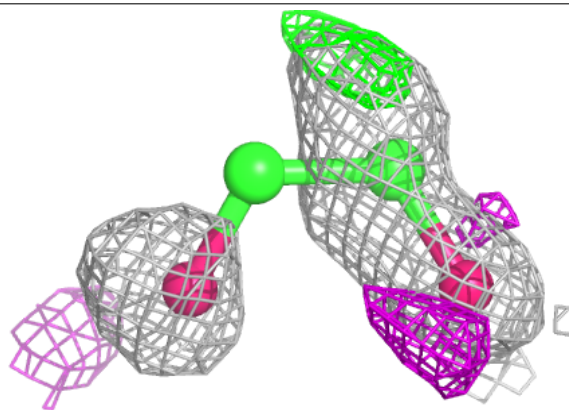
Electron density around 1PE A 712:

2mF$_o$-DF$_c$ (at 0.7 rmsd) in gray
mF$_o$-DF$_c$ (at 3 rmsd) in purple (negative)
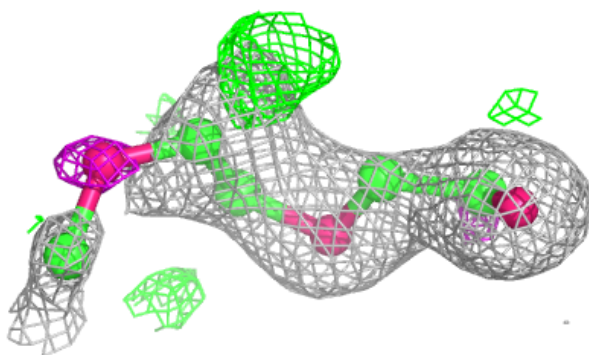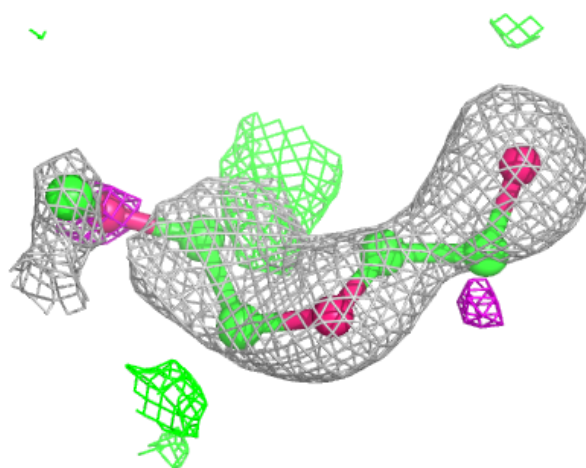and green (positive)
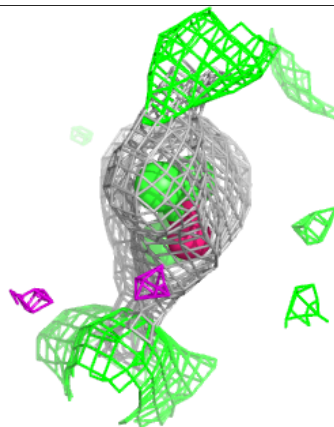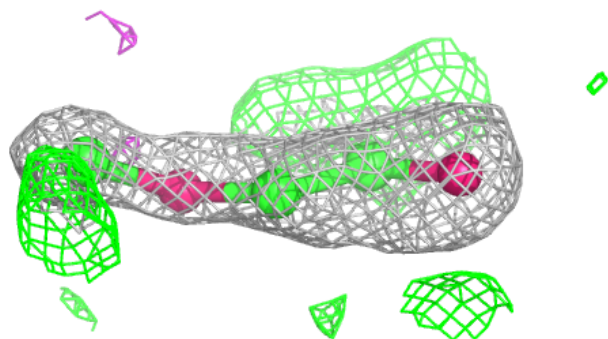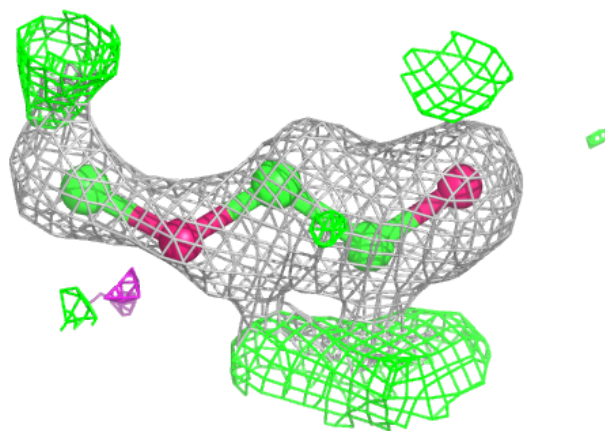
Electron density around 1PE A 722:

$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)
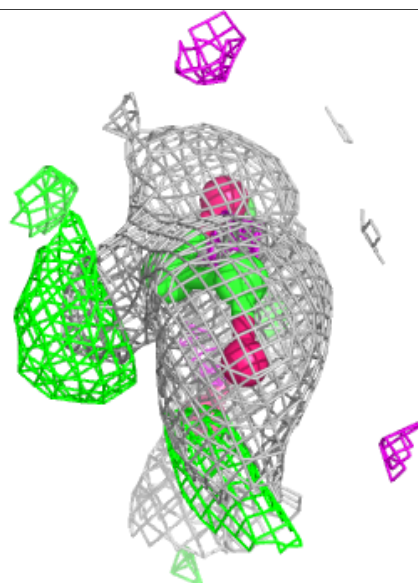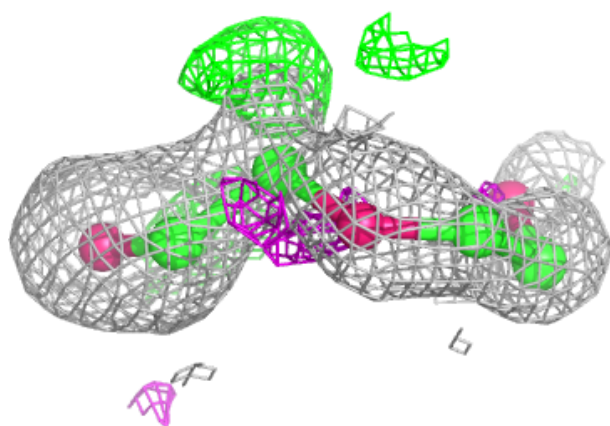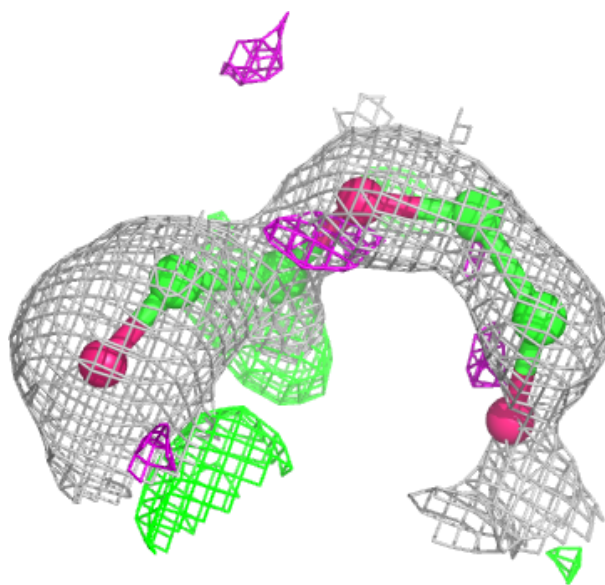
Electron density around 1PE A 716:

2mF$_o$-DF$_c$ (at 0.7 rmsd) in gray
mF$_o$-DF$_c$ (at 3 rmsd) in purple (negative)
and green (positive)
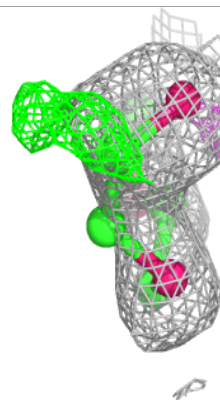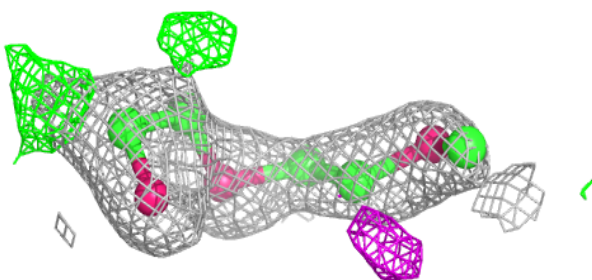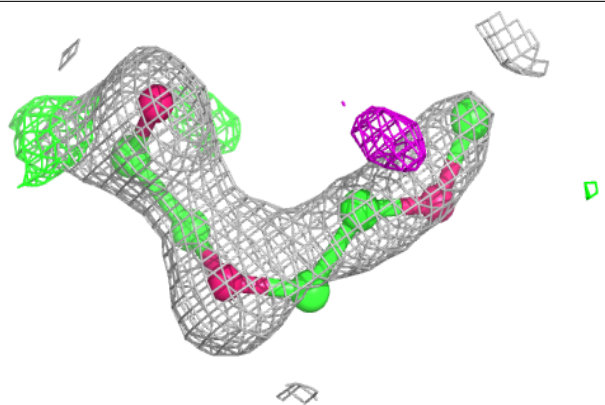
Electron density around 1PE A 720:

2mF$_o$-DF$_c$ (at 0.7 rmsd) in gray
mF$_o$-DF$_c$ (at 3 rmsd) in purple (negative)
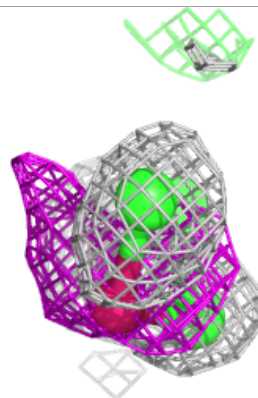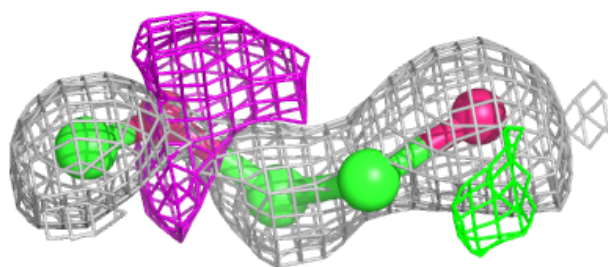and green (positive)
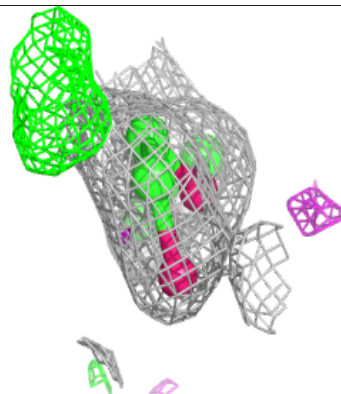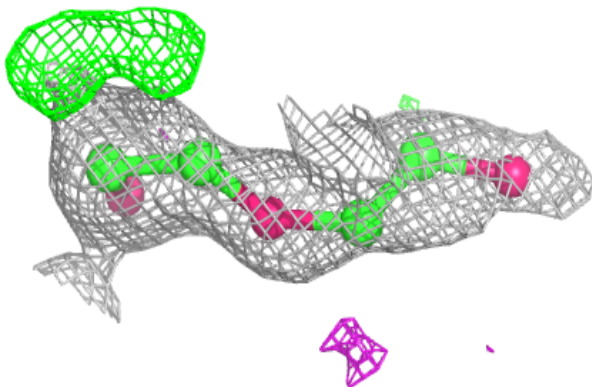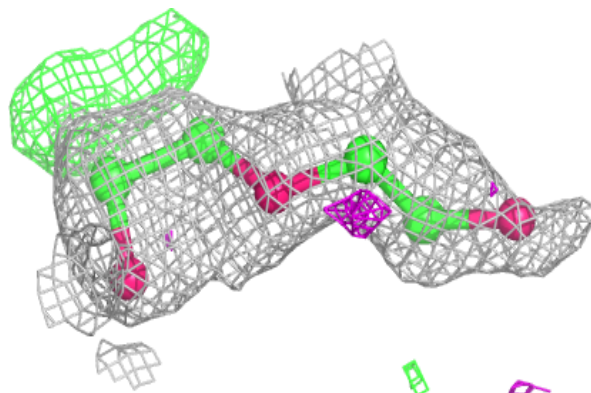
Electron density around 1PE A 714:

2mF$_o$-DF$_c$ (at 0.7 rmsd) in gray
mF$_o$-DF$_c$ (at 3 rmsd) in purple (negative)
and green (positive)
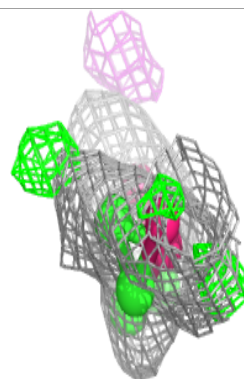
Electron density around 1PE A 718:

2mF$_o$-DF$_c$ (at 0.7 rmsd) in gray
mF$_o$-DF$_c$ (at 3 rmsd) in purple (negative)
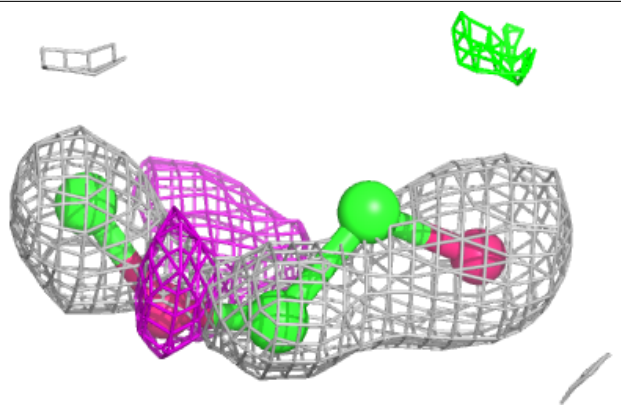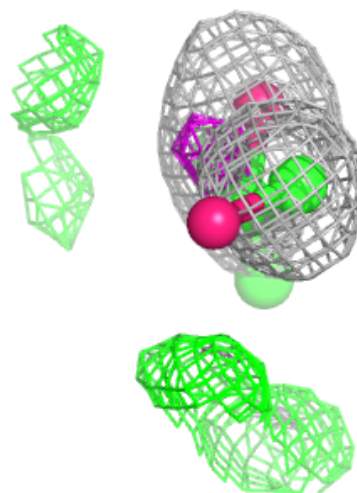and green (positive)
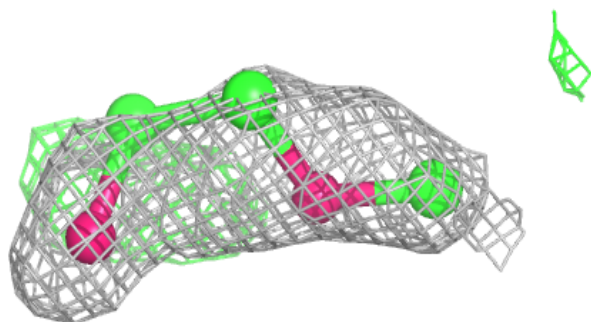
Electron density around 1PE A 726:

2mF$_o$-DF$_c$ (at 0.7 rmsd) in gray
mF$_o$-DF$_c$ (at 3 rmsd) in purple (negative)
and green (positive)
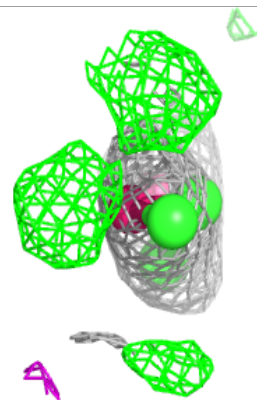
Electron density around 1PE A 725:

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 1PE A 711:

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

Electron density around 1PE A 713:

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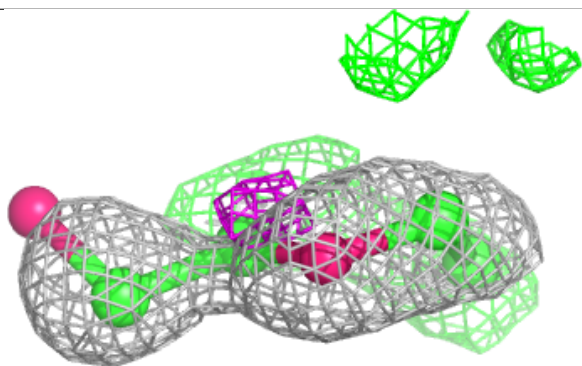$mF_o\text{-}DF_c$ (at 3 rmsd) in purple (negative)
and green (positive)

Electron density around 1PE A 717:

2mF$_o$-DF$_c$ (at 0.7 rmsd) in gray
mF$_o$-DF$_c$ (at 3 rmsd) in purple (negative)
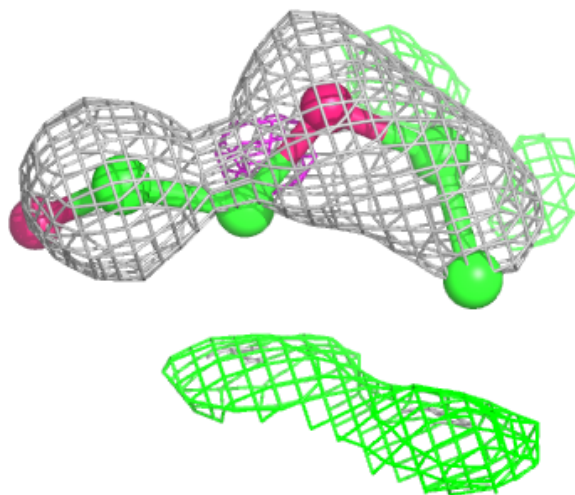and green (positive)

Electron density around 1PE A 721:

2mF$_o$-DF$_c$ (at 0.7 rmsd) in gray
mF$_o$-DF$_c$ (at 3 rmsd) in purple (negative)
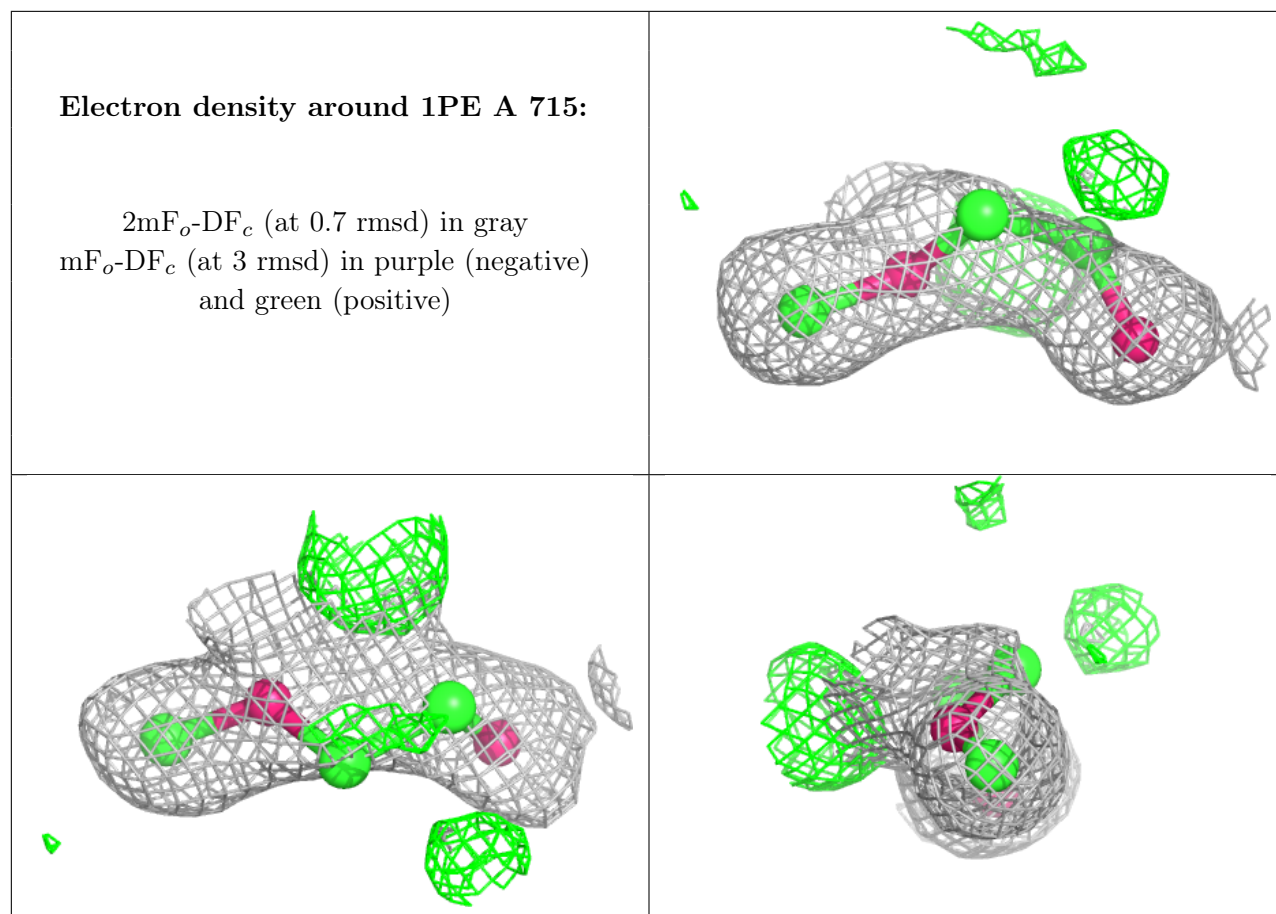and green (positive)

Electron density around 1PE A 719:

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

Electron density around 1PE A 715:

$2mF_o$-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 ⓘ

There are no such residues in this entry.