



# Full wwPDB X-ray Structure Validation Report ⓘ

Nov 20, 2023 – 10:45 AM EST

PDB ID : 2R1Y  
Title : Crystal structure of S25-2 Fab in complex with Kdo analogues  
Authors : Brooks, C.L.; Evans, S.V.  
Deposited on : 2007-08-23  
Resolution : 1.60 Å(reported)

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

We welcome your comments at [validation@mail.wwpdb.org](mailto:validation@mail.wwpdb.org)

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

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

MolProbity : 4.02b-467  
Mogul : 1.8.5 (274361), CSD as541be (2020)  
Xtriage (Phenix) : 1.13  
EDS : 2.36  
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



## 2 Entry composition

There are 6 unique types of molecules in this entry. The entry contains 3735 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 Fab, antibody fragment (IgG1k), light chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	217	Total 1684	C 1047	N 286	O 343	S 8	0	0	0

- Molecule 2 is a protein called Fab, antibody fragment (IgG1k), heavy chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	216	Total 1661	C 1055	N 276	O 323	S 7	0	0	0

- Molecule 3 is an oligosaccharide called 3-deoxy-alpha-D-manno-oct-2-ulopyranosonic acid-(2-4)-prop-2-en-1-yl 3-deoxy-alpha-D-manno-octos-2-ulopyranoside.

Mol	Chain	Residues	Atoms			ZeroOcc	AltConf	Trace
			Total	C	O			
3	C	2	Total 33	C 19	O 14	0	0	0

- Molecule 4 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	2	Total 2	Mg 2	0	0

- Molecule 5 is ZINC ION (three-letter code: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	1	Total 1	Zn 1	0	0

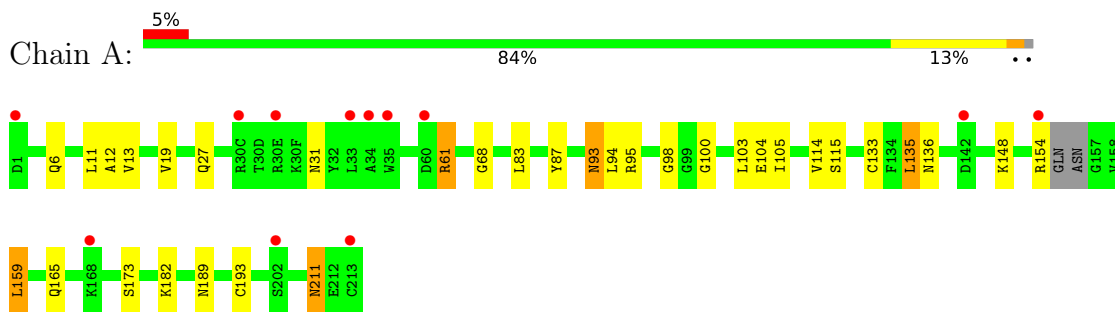
- Molecule 6 is water.

<b>Mol</b>	<b>Chain</b>	<b>Residues</b>	<b>Atoms</b>		<b>ZeroOcc</b>	<b>AltConf</b>
6	A	177	Total 177	O 177	0	0
6	B	177	Total 177	O 177	0	0

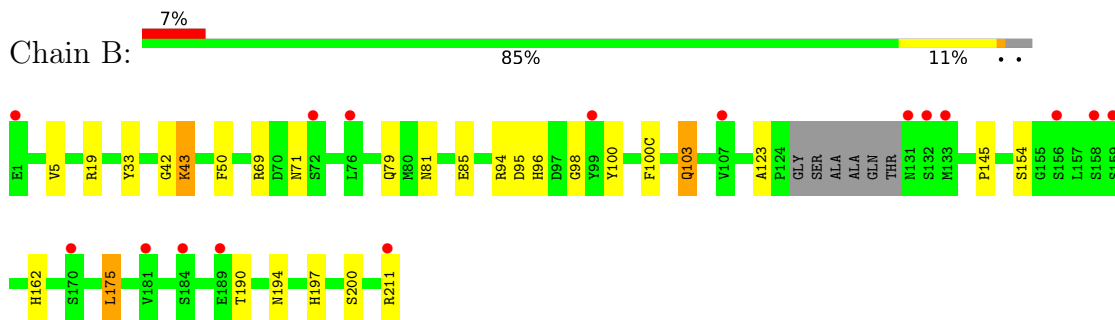
### 3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red dot above a residue indicates a poor fit to the electron density (RSRZ > 2). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

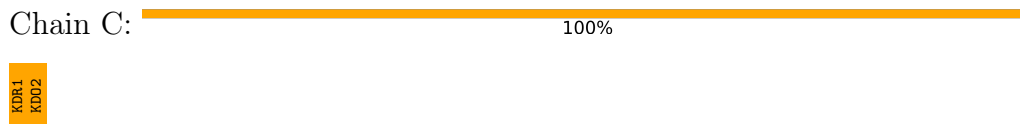
- Molecule 1: Fab, antibody fragment (IgG1k), light chain



- Molecule 2: Fab, antibody fragment (IgG1k), heavy chain



- Molecule 3: 3-deoxy-alpha-D-manno-oct-2-ulopyranosonic acid-(2-4)-prop-2-en-1-yl 3-deoxy-alpha-D-manno-octos-2-ulopyranoside











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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:19:ARG:HH11	2:B:79:GLN:HE22	1.60	0.50
2:B:69:ARG:NE	2:B:71:ASN:HD21	2.08	0.49
1:A:83:LEU:HD13	1:A:165:GLN:NE2	2.24	0.49
1:A:31:ASN:ND2	1:A:68:GLY:H	2.10	0.49
2:B:154:SER:H	2:B:194:ASN:ND2	2.03	0.49
2:B:5:VAL:HA	2:B:103:GLN:HE22	1.77	0.48
1:A:105:ILE:H	1:A:165:GLN:NE2	2.08	0.46
1:A:13:VAL:CG1	1:A:103:LEU:HD11	2.44	0.46
1:A:94:LEU:C	1:A:95:ARG:HD2	2.36	0.46
1:A:136:ASN:ND2	1:A:173:SER:HB3	2.30	0.46
1:A:114:VAL:HG13	1:A:135:LEU:HD13	1.97	0.46
3:C:1:KDR:H9	3:C:1:KDR:H6	1.98	0.46
2:B:19:ARG:HH11	2:B:79:GLN:NE2	2.13	0.46
1:A:6:GLN:NE2	1:A:100:GLY:H	2.14	0.45
1:A:6:GLN:HE22	1:A:87:TYR:HA	1.81	0.45
1:A:182:LYS:HE3	6:A:301:HOH:O	2.17	0.45
2:B:33:TYR:HB2	2:B:95:ASP:HB3	1.99	0.45
2:B:85:GLU:H	2:B:85:GLU:CD	2.19	0.45
2:B:96:HIS:CE1	2:B:98:GLY:HA2	2.52	0.45
1:A:6:GLN:HE21	1:A:98:GLY:HA3	1.82	0.45
1:A:61:ARG:NH1	1:A:61:ARG:CG	2.79	0.45
2:B:197:HIS:CD2	2:B:200:SER:OG	2.69	0.45
2:B:94:ARG:O	2:B:100(C):PHE:HA	2.18	0.44
3:C:1:KDR:H9	3:C:1:KDR:C6	2.48	0.43
2:B:69:ARG:HE	2:B:71:ASN:ND2	2.15	0.43
1:A:115:SER:O	1:A:133:CYS:HA	2.19	0.43
2:B:123:ALA:H	2:B:211:ARG:NH2	2.17	0.42
1:A:154:ARG:NH1	6:A:305:HOH:O	2.53	0.41
1:A:27:GLN:HG3	6:A:266:HOH:O	2.22	0.40

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	213/219 (97%)	207 (97%)	6 (3%)	0	100	100
2	B	212/222 (96%)	207 (98%)	5 (2%)	0	100	100
All	All	425/441 (96%)	414 (97%)	11 (3%)	0	100	100

There are no Ramachandran outliers to report.

### 5.3.2 Protein sidechains [i](#)

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	193/195 (99%)	187 (97%)	6 (3%)	40	15
2	B	187/190 (98%)	183 (98%)	4 (2%)	53	29
All	All	380/385 (99%)	370 (97%)	10 (3%)	46	21

All (10) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	61	ARG
1	A	93	ASN
1	A	135	LEU
1	A	148	LYS
1	A	159	LEU
1	A	211	ASN
2	B	43	LYS
2	B	50	PHE
2	B	103	GLN
2	B	175	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (17) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	6	GLN
1	A	31	ASN
1	A	42	GLN

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Mol	Chain	Res	Type
1	A	93	ASN
1	A	136	ASN
1	A	160	ASN
1	A	165	GLN
1	A	189	ASN
1	A	211	ASN
2	B	71	ASN
2	B	79	GLN
2	B	81	ASN
2	B	96	HIS
2	B	103	GLN
2	B	169	GLN
2	B	194	ASN
2	B	197	HIS

### 5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

## 5.5 Carbohydrates [i](#)

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
3	KDR	C	1	3	15,18,18	1.51	2 (13%)	17,25,25	1.14	1 (5%)
3	KDO	C	2	3	15,15,16	1.07	1 (6%)	19,21,24	0.96	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	KDR	C	1	3	-	5/12/32/32	0/1/1/1
3	KDO	C	2	3	-	0/10/26/30	0/1/1/1

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	C	1	KDR	O6-C2	3.40	1.48	1.42
3	C	1	KDR	O4-C4	2.87	1.49	1.43
3	C	2	KDO	C2-C1	2.38	1.54	1.52

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	C	2	KDO	O1A-C1-C2	-2.73	116.12	122.57
3	C	1	KDR	C3-C4-C5	-2.64	108.25	110.84

There are no chirality outliers.

All (5) torsion outliers are listed below:

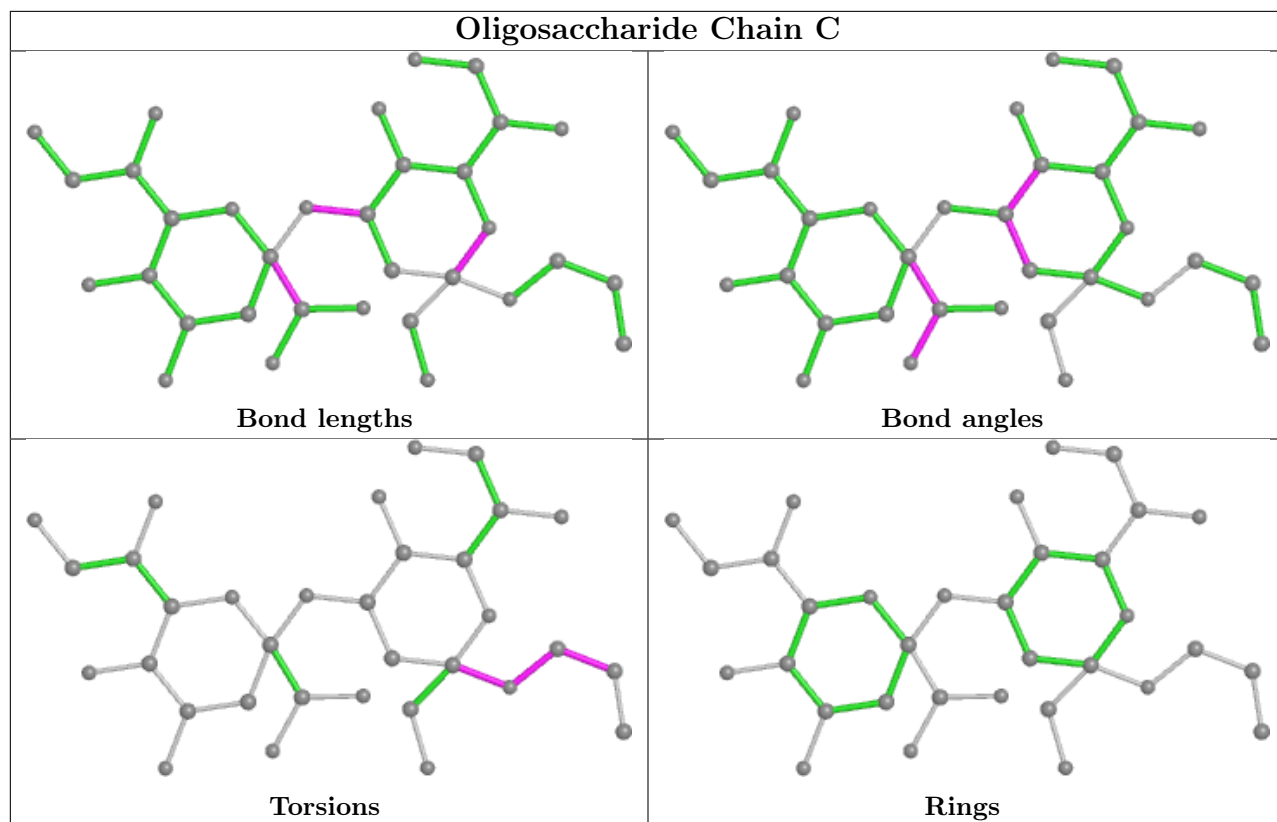
Mol	Chain	Res	Type	Atoms
3	C	1	KDR	C10-C9-O2-C2
3	C	1	KDR	C1-C2-O2-C9
3	C	1	KDR	C3-C2-O2-C9
3	C	1	KDR	O6-C2-O2-C9
3	C	1	KDR	C11-C10-C9-O2

There are no ring outliers.

2 monomers are involved in 3 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	C	1	KDR	3	0
3	C	2	KDO	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 oligosaccharide.



## 5.6 Ligand geometry [i](#)

Of 3 ligands modelled in this entry, 3 are monoatomic - leaving 0 for Mogul analysis.

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

## 5.7 Other polymers [i](#)

There are no such residues in this entry.

## 5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

## 6 Fit of model and data

### 6.1 Protein, DNA and RNA chains

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

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å <sup>2</sup> )	Q<0.9
1	A	217/219 (99%)	0.36	12 (5%) 25 22	17, 23, 31, 45	0
2	B	216/222 (97%)	0.43	16 (7%) 14 13	16, 22, 35, 47	0
All	All	433/441 (98%)	0.40	28 (6%) 18 17	16, 23, 33, 47	0

All (28) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	B	99	TYR	6.6
2	B	131	ASN	6.2
2	B	132	SER	4.7
1	A	213	CYS	3.5
1	A	168	LYS	3.5
2	B	211	ARG	3.4
1	A	202	SER	3.3
1	A	1	ASP	3.2
1	A	30(C)	ARG	3.1
2	B	184	SER	3.1
1	A	60	ASP	2.9
1	A	154	ARG	2.8
2	B	159	SER	2.8
2	B	170	SER	2.7
2	B	1	GLU	2.7
1	A	35	TRP	2.6
1	A	142	ASP	2.6
2	B	189	GLU	2.5
1	A	33	LEU	2.5
1	A	34	ALA	2.4
2	B	72	SER	2.4
2	B	76	LEU	2.4
2	B	158	SER	2.3
2	B	133	MET	2.3

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Mol	Chain	Res	Type	RSRZ
2	B	107	VAL	2.2
2	B	156	SER	2.2
1	A	30(E)	ARG	2.1
2	B	181	VAL	2.1

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

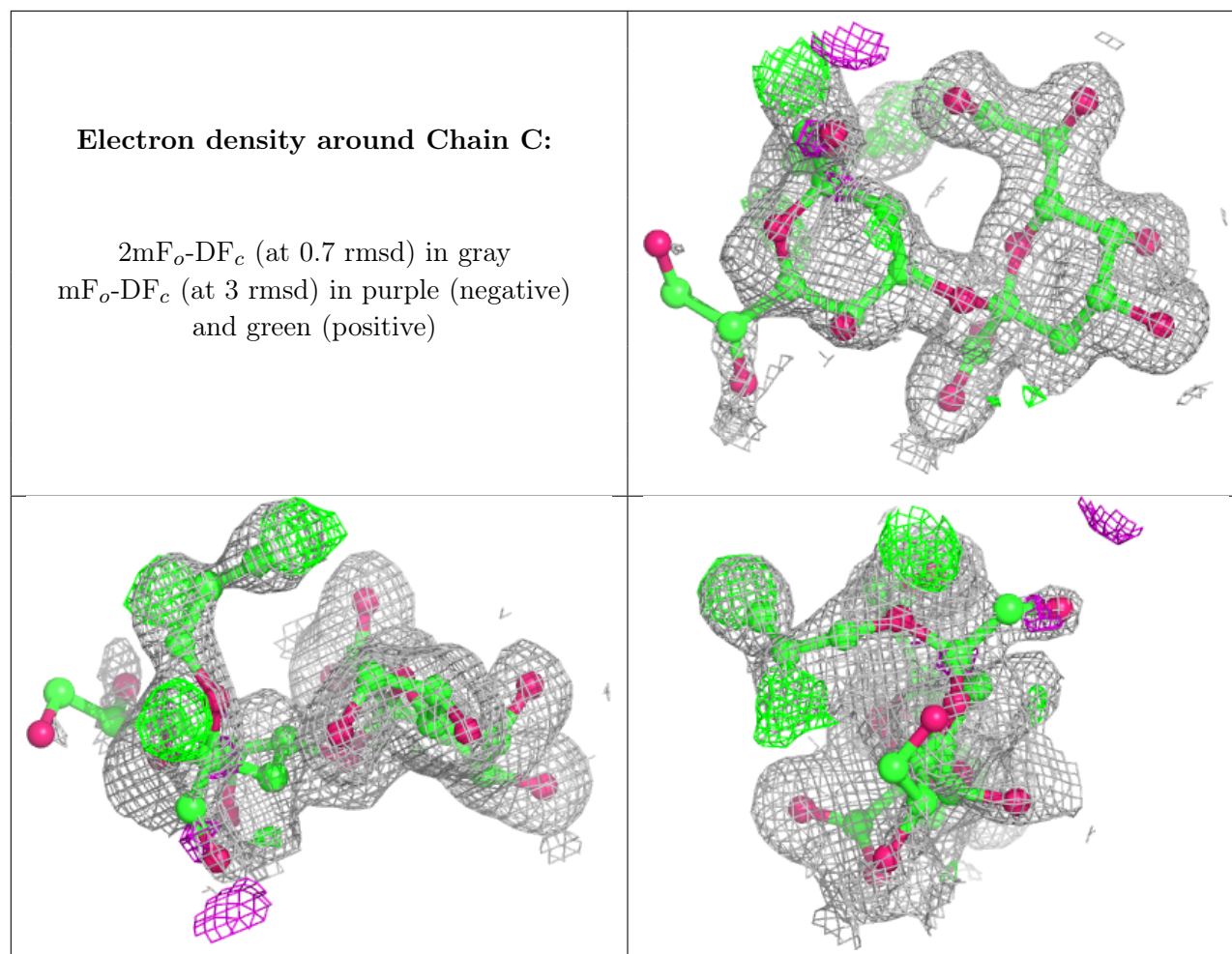
There are no non-standard protein/DNA/RNA residues in this entry.

## 6.3 Carbohydrates [i](#)

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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
3	KDR	C	1	18/18	0.65	0.34	26,43,48,49	0
3	KDO	C	2	15/16	0.94	0.09	19,21,26,28	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.



## 6.4 Ligands (i)

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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å <sup>2</sup> )	Q<0.9
4	MG	A	214	1/1	0.56	0.14	35,35,35,35	0
4	MG	A	215	1/1	0.97	0.08	24,24,24,24	0
5	ZN	A	216	1/1	0.99	0.04	24,24,24,24	0

## 6.5 Other polymers (i)

There are no such residues in this entry.