



# Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 08:50 PM UTC

PDB ID : 3EHS / pdb\_00003ehs  
Title : Crystal structure of the extracellular domain of human corticotropin releasing factor receptor type 1 (CRFR1)  
Authors : Pioszak, A.A.; Xu, H.E.  
Deposited on : 2008-09-14  
Resolution : 2.76 Å(reported)

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

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

A user guide is available at

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

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

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

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

MolProbity : 4-5-2 with Phenix2.0  
Mogul : 2022.3.0, CSD as543be (2022)  
Xtriage (Phenix) : 2.0  
EDS : 3.0  
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)  
CCP4 : 9.0.010 (Gargrove)  
Density-Fitness : 1.0.12  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.49

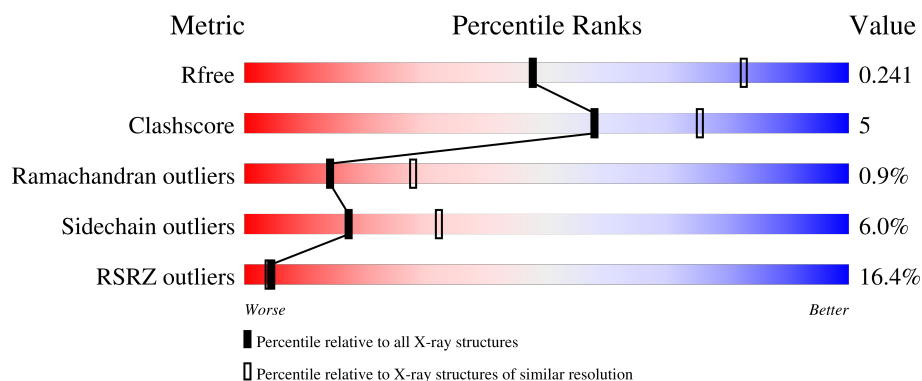
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.76 Å.

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



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
$R_{free}$	180053	1009 (2.76-2.76)
Clashscore	190562	1044 (2.76-2.76)
Ramachandran outliers	187476	1024 (2.76-2.76)
Sidechain outliers	187428	1024 (2.76-2.76)
RSRZ outliers	180081	1009 (2.76-2.76)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for  $\geq 3$ , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions  $\leq 5\%$ . The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	476	<div> <div>16%</div> <div>81%</div> <div>14%</div> <div>••</div> </div>
2	B	2	<div>100%</div>

## 2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 3568 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 fusion protein of CRFR1 extracellular domain and MBP.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	457	3539	2261	585	681	12	0	0	0

There are 13 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-350	MET	-	initiating methionine	UNP P0AEX9
A	18	ASN	-	linker	UNP P0AEX9
A	19	ALA	-	linker	UNP P0AEX9
A	20	ALA	-	linker	UNP P0AEX9
A	21	ALA	-	linker	UNP P0AEX9
A	22	GLU	-	linker	UNP P0AEX9
A	23	PHE	-	linker	UNP P0AEX9
A	120	HIS	-	expression tag	UNP P34998
A	121	HIS	-	expression tag	UNP P34998
A	122	HIS	-	expression tag	UNP P34998
A	123	HIS	-	expression tag	UNP P34998
A	124	HIS	-	expression tag	UNP P34998
A	125	HIS	-	expression tag	UNP P34998

- Molecule 2 is an oligosaccharide called alpha-D-glucopyranose-(1-4)-alpha-D-glucopyranose.



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf	Trace
			Total	C	O			
2	B	2	23	12	11	0	0	0

- Molecule 3 is water.

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



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 41 21 2	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	112.02Å 112.02Å 145.79Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	50.00 – 2.76 50.00 – 2.76	Depositor EDS
% Data completeness (in resolution range)	98.3 (50.00-2.76) 98.4 (50.00-2.76)	Depositor EDS
$R_{merge}$	0.06	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	4.66 (at 2.76Å)	Xtriage
Refinement program	REFMAC 5.2.0019	Depositor
R, $R_{free}$	0.207 , 0.240 0.209 , 0.241	Depositor DCC
$R_{free}$ test set	1238 reflections (5.12%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	88.6	Xtriage
Anisotropy	0.207	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.34 , 107.2	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
$F_o, F_c$ correlation	0.93	EDS
Total number of atoms	3568	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	93.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.23% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical values of  $\langle |L| \rangle$ ,  $\langle L^2 \rangle$  for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

## 5 Model quality [i](#)

### 5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: GLC

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	0.71	4/3624 (0.1%)	0.89	1/4925 (0.0%)

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	-129	GLY	C-O	8.88	1.36	1.24
1	A	-67	ASN	CG-ND2	6.19	1.46	1.33
1	A	-320	LYS	C-O	6.07	1.31	1.23
1	A	-318	THR	C-O	5.07	1.31	1.23

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	38	ASN	N-CA-C	5.19	117.70	109.24

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	3539	0	3460	32	0
2	B	23	0	21	0	0
3	A	6	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
All	All	3568	0	3481	32	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 5.

All (32) 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:51:ILE:HD11	1:A:99:TYR:CE1	2.23	0.73
1:A:51:ILE:HD11	1:A:99:TYR:CZ	2.26	0.71
1:A:27:ASP:O	1:A:31:GLU:HG3	1.92	0.69
1:A:69:PRO:HB3	1:A:76:ARG:NH1	2.19	0.58
1:A:71:PHE:CE2	1:A:76:ARG:HG3	2.42	0.55
1:A:-334:LYS:HE3	1:A:-238:GLU:OE2	2.06	0.55
1:A:24:SER:HB2	1:A:27:ASP:OD2	2.09	0.53
1:A:-305:GLU:HB2	1:A:-283:ARG:HD2	1.91	0.52
1:A:-195:PRO:HD3	1:A:-5:ARG:HG3	1.91	0.52
1:A:-281:GLY:HA3	1:A:-17:ASN:O	2.11	0.51
1:A:65:VAL:HG22	1:A:84:TYR:CD2	2.48	0.48
1:A:-260:LEU:HD12	1:A:-255:TRP:CZ2	2.50	0.47
1:A:-252:VAL:O	1:A:-245:ILE:HG12	2.16	0.46
1:A:-131:ASN:HD21	1:A:-114:ILE:HG12	1.81	0.45
1:A:51:ILE:CD1	1:A:99:TYR:CE1	2.97	0.45
1:A:-3:ALA:HB2	1:A:15:ALA:HB2	1.99	0.45
1:A:33:LEU:HD12	1:A:54:CYS:SG	2.57	0.44
1:A:-195:PRO:HD3	1:A:-5:ARG:CG	2.47	0.44
1:A:80:THR:HG22	1:A:80:THR:O	2.18	0.43
1:A:-165:ASP:CB	1:A:12:LEU:HB3	2.49	0.43
1:A:71:PHE:CZ	1:A:76:ARG:HG3	2.54	0.42
1:A:-220:TRP:HA	1:A:-217:ILE:HD12	2.02	0.42
1:A:-212:LYS:HA	1:A:-209:LYS:HG3	2.00	0.42
1:A:-340:ILE:HG12	1:A:-290:ILE:HB	2.01	0.42
1:A:-175:GLY:O	1:A:-174:LYS:HB3	2.20	0.42
1:A:-298:ALA:O	1:A:-295:GLY:N	2.51	0.41
1:A:103:GLN:O	1:A:107:ASN:ND2	2.41	0.41
1:A:-342:LEU:HB2	1:A:-314:VAL:HG22	2.02	0.41
1:A:65:VAL:HG22	1:A:84:TYR:HD2	1.86	0.41
1:A:-287:TRP:CD1	1:A:-286:ALA:N	2.89	0.40
1:A:51:ILE:HG13	1:A:69:PRO:HG3	2.03	0.40
1:A:-347:ILE:H	1:A:-347:ILE:HG13	1.41	0.40



There are no symmetry-related clashes.

## 5.3 Torsion angles [i](#)

### 5.3.1 Protein backbone [i](#)

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

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

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles
1	A	455/476 (96%)	436 (96%)	15 (3%)	4 (1%)	14 28

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	24	SER
1	A	35	LEU
1	A	-319	ASP
1	A	-181	ALA

### 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	368/385 (96%)	346 (94%)	22 (6%)	17 32

All (22) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	-347	ILE
1	A	-319	ASP
1	A	-313	THR
1	A	-308	ASP

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Mol	Chain	Res	Type
1	A	-296	THR
1	A	-289	ILE
1	A	-271	GLU
1	A	-229	ASP
1	A	-168	VAL
1	A	-166	VAL
1	A	-165	ASP
1	A	-91	PHE
1	A	-71	GLU
1	A	5	ARG
1	A	14	ASP
1	A	16	GLN
1	A	24	SER
1	A	25	LEU
1	A	48	VAL
1	A	51	ILE
1	A	86	GLU
1	A	105	ILE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (9) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	-331	ASN
1	A	-300	GLN
1	A	-249	ASN
1	A	-231	ASN
1	A	-148	ASN
1	A	-131	ASN
1	A	45	ASN
1	A	81	ASN
1	A	82	ASN

### 5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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

## 5.5 Carbohydrates

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	GLC	B	1	2	12,12,12	0.64	0	17,17,17	1.03	1 (5%)
2	GLC	B	2	2	11,11,12	0.63	0	15,15,17	1.31	1 (6%)

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	GLC	B	1	2	-	2/2/22/22	0/1/1/1
2	GLC	B	2	2	-	0/2/19/22	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(°)	Ideal(°)
2	B	2	GLC	C1-O5-C5	4.60	118.36	112.19
2	B	1	GLC	C1-O5-C5	2.92	119.30	113.65

There are no chirality outliers.

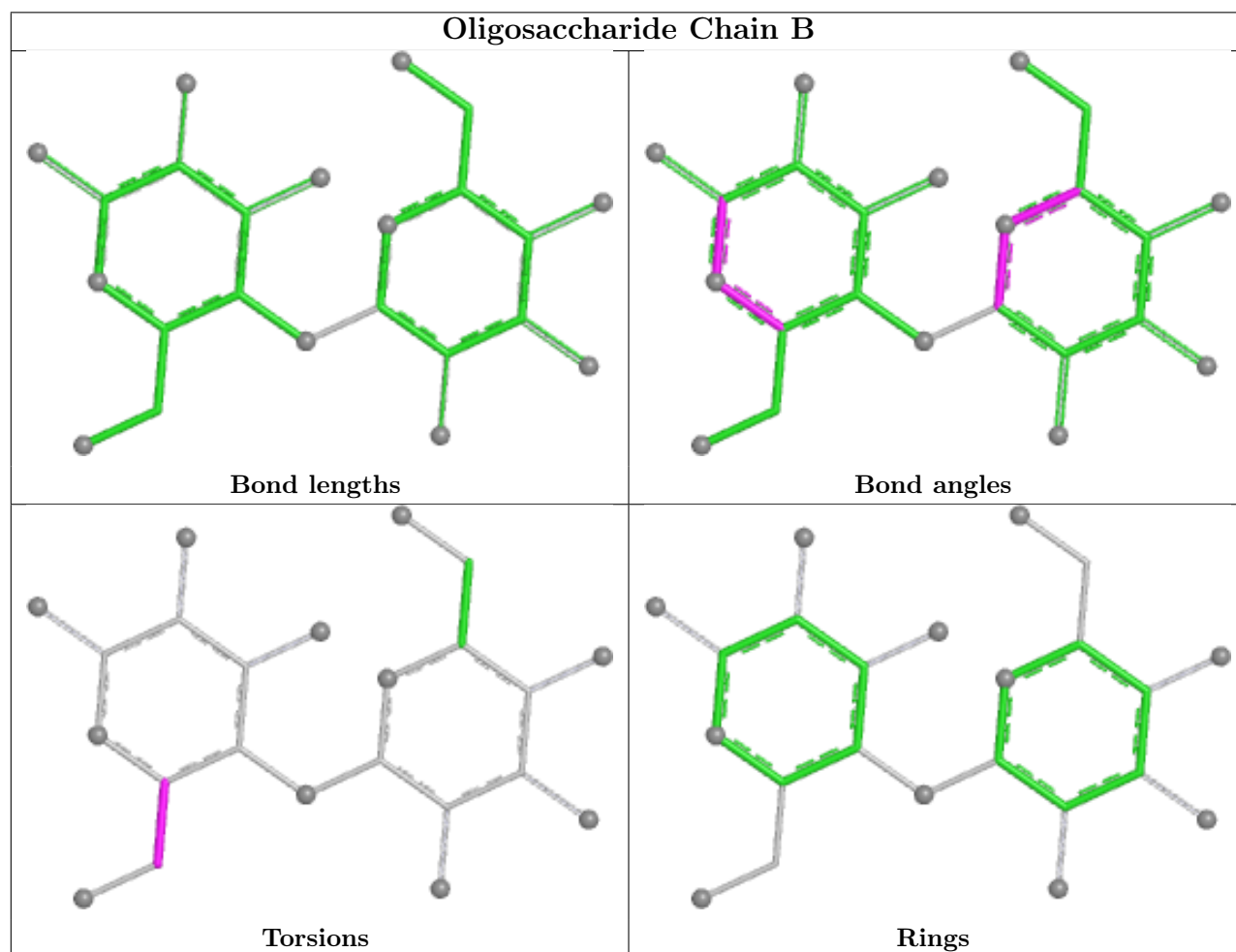
All (2) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	B	1	GLC	C4-C5-C6-O6
2	B	1	GLC	O5-C5-C6-O6

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.



## 5.6 Ligand geometry [i](#)

There are no ligands in this entry.

## 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	457/476 (96%)	1.16	75 (16%) 4 4	78, 93, 102, 112	0

All (75) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	36	ALA	9.1
1	A	37	SER	6.0
1	A	35	LEU	5.8
1	A	-347	ILE	4.8
1	A	107	ASN	4.4
1	A	-297	ALA	4.2
1	A	29	HIS	3.9
1	A	-295	GLY	3.8
1	A	-246	LEU	3.6
1	A	-97	GLY	3.6
1	A	-71	GLU	3.4
1	A	-214	LEU	3.4
1	A	31	GLU	3.3
1	A	-106	GLY	3.2
1	A	-247	LYS	3.2
1	A	-235	SER	3.2
1	A	-209	LYS	3.0
1	A	-186	ALA	3.0
1	A	-180	PHE	3.0
1	A	-304	GLU	3.0
1	A	-272	ALA	3.0
1	A	-16	ILE	2.9
1	A	-36	LYS	2.8
1	A	21	ALA	2.8
1	A	-276	SER	2.8
1	A	-171	ILE	2.8
1	A	-248	GLY	2.8

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Mol	Chain	Res	Type	RSRZ
1	A	-346	GLU	2.8
1	A	-245	ILE	2.7
1	A	-142	ASP	2.7
1	A	106	LEU	2.7
1	A	-229	ASP	2.7
1	A	-339	TRP	2.6
1	A	-108	ASN	2.6
1	A	-278	ALA	2.6
1	A	-220	TRP	2.6
1	A	-201	MET	2.5
1	A	-279	TYR	2.5
1	A	-232	TYR	2.5
1	A	-277	GLN	2.5
1	A	-268	PRO	2.5
1	A	-113	ASP	2.4
1	A	8	VAL	2.4
1	A	-84	GLY	2.4
1	A	20	ALA	2.4
1	A	-83	ILE	2.4
1	A	34	SER	2.4
1	A	-335	ASP	2.4
1	A	-296	THR	2.3
1	A	-8	TYR	2.3
1	A	23	PHE	2.3
1	A	39	ILE	2.2
1	A	14	ASP	2.2
1	A	-258	PRO	2.2
1	A	-348	LYS	2.2
1	A	-275	GLY	2.2
1	A	25	LEU	2.2
1	A	22	GLU	2.2
1	A	-194	TYR	2.2
1	A	-170	LYS	2.2
1	A	-132	PHE	2.2
1	A	-124	THR	2.1
1	A	-174	LYS	2.1
1	A	-231	ASN	2.1
1	A	105	ILE	2.1
1	A	-230	LYS	2.1
1	A	54	CYS	2.1
1	A	-325	GLY	2.1
1	A	-172	ASP	2.1

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Mol	Chain	Res	Type	RSRZ
1	A	-31	ALA	2.1
1	A	-269	THR	2.1
1	A	-173	TYR	2.1
1	A	-308	ASP	2.0
1	A	38	ASN	2.0
1	A	-107	TYR	2.0

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

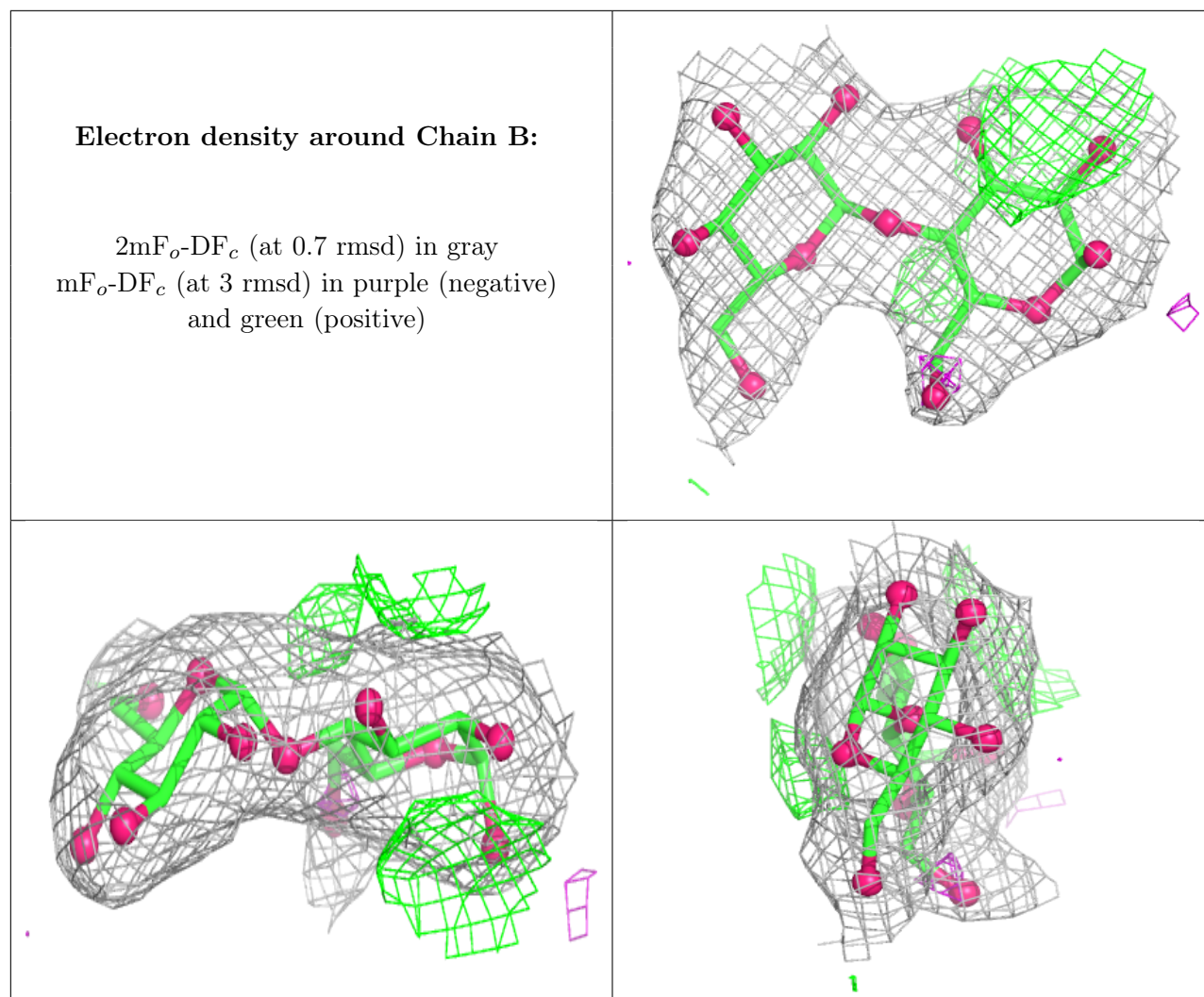
There are no non-standard protein/DNA/RNA residues in this entry.

## 6.3 Carbohydrates [i](#)

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
2	GLC	B	1	12/12	0.91	0.14	91,92,95,96	0
2	GLC	B	2	11/12	0.96	0.10	86,91,92,92	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](#)

There are no ligands in this entry.

## 6.5 Other polymers [i](#)

There are no such residues in this entry.