



Full wwPDB X-ray Structure Validation Report ⓘ

Aug 23, 2023 – 09:00 AM EDT

PDB ID : 3EHS
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

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>.

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 : 2.35
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) : 2.35

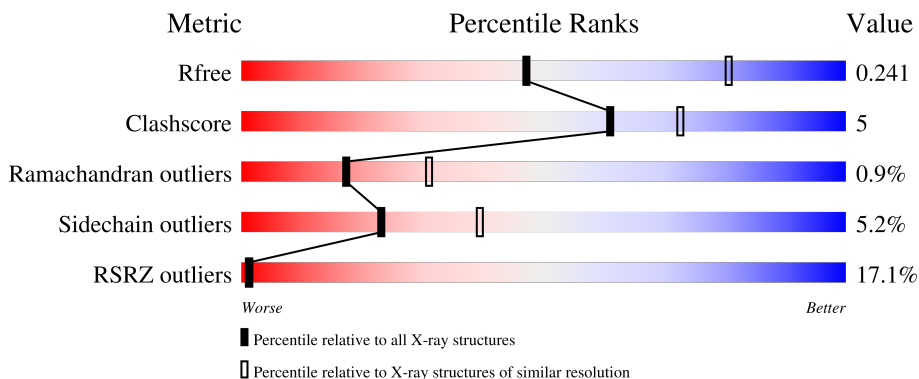
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

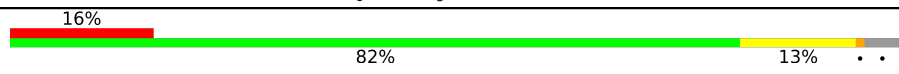
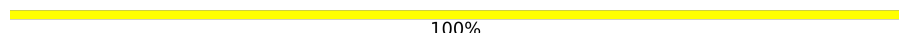
The reported resolution of this entry is 2.76 Å.

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}	130704	1235 (2.78-2.74)
Clashscore	141614	1277 (2.78-2.74)
Ramachandran outliers	138981	1257 (2.78-2.74)
Sidechain outliers	138945	1257 (2.78-2.74)
RSRZ outliers	127900	1207 (2.78-2.74)

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 $\leq 5\%$. 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	
2	B	2	

2 Entry composition i

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

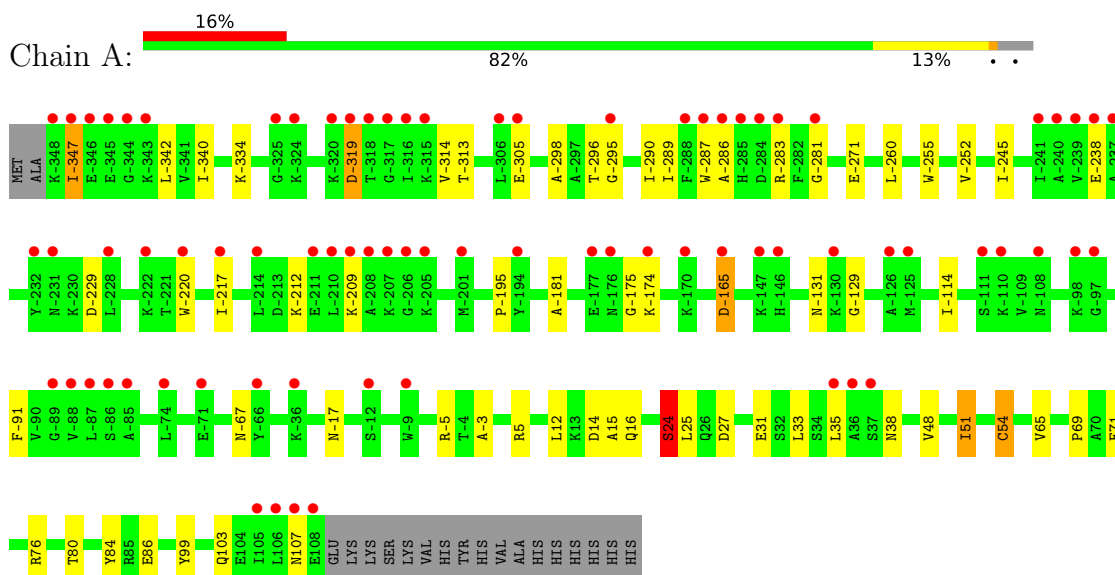
- Molecule 3 is water.

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

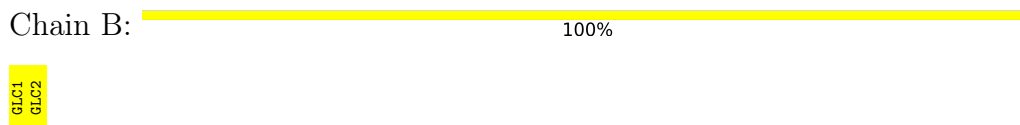
3 Residue-property plots [i](#)

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: fusion protein of CRFR1 extracellular domain and MBP



- Molecule 2: alpha-D-glucopyranose-(1-4)-alpha-D-glucopyranose



4 Data and refinement statistics

Property	Value	Source
Space group	P 41 21 2	Depositor
Cell constants a, b, c, α , β , γ	112.02Å 112.02Å 145.79Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	50.00 – 2.76 34.66 – 2.76	Depositor EDS
% Data completeness (in resolution range)	98.3 (50.00-2.76) 98.4 (34.66-2.76)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	4.66 (at 2.76Å)	Xtrriage
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 ²)	88.6	Xtrriage
Anisotropy	0.207	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.33 , 102.7	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	3568	wwPDB-VP
Average B, all atoms (Å ²)	93.0	wwPDB-VP

Xtrriage'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.*

¹Intensities estimated from amplitudes.

²Theoretical 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	0.60	2/3624 (0.1%)	0.61	0/4925

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	-129	GLY	C-O	8.15	1.36	1.23
1	A	-67	ASN	CG-ND2	5.36	1.46	1.32

There are no bond angle outliers.

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
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%)	17 31

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%)	349 (95%)	19 (5%)	23 39

All (19) 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	-296	THR
1	A	-289	ILE
1	A	-271	GLU
1	A	-229	ASP

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Mol	Chain	Res	Type
1	A	-165	ASP
1	A	-91	PHE
1	A	5	ARG
1	A	14	ASP
1	A	16	GLN
1	A	24	SER
1	A	25	LEU
1	A	38	ASN
1	A	48	VAL
1	A	51	ILE
1	A	54	CYS
1	A	86	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (4) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	-300	GLN
1	A	-249	ASN
1	A	-131	ASN
1	A	81	ASN

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
2	GLC	B	1	2	12,12,12	0.65	0	17,17,17	1.05	1 (5%)
2	GLC	B	2	2	11,11,12	0.64	0	15,15,17	1.32	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	4.55	118.36	112.19
2	B	1	GLC	C1-O5-C5	2.99	119.30	113.66

There are no chirality outliers.

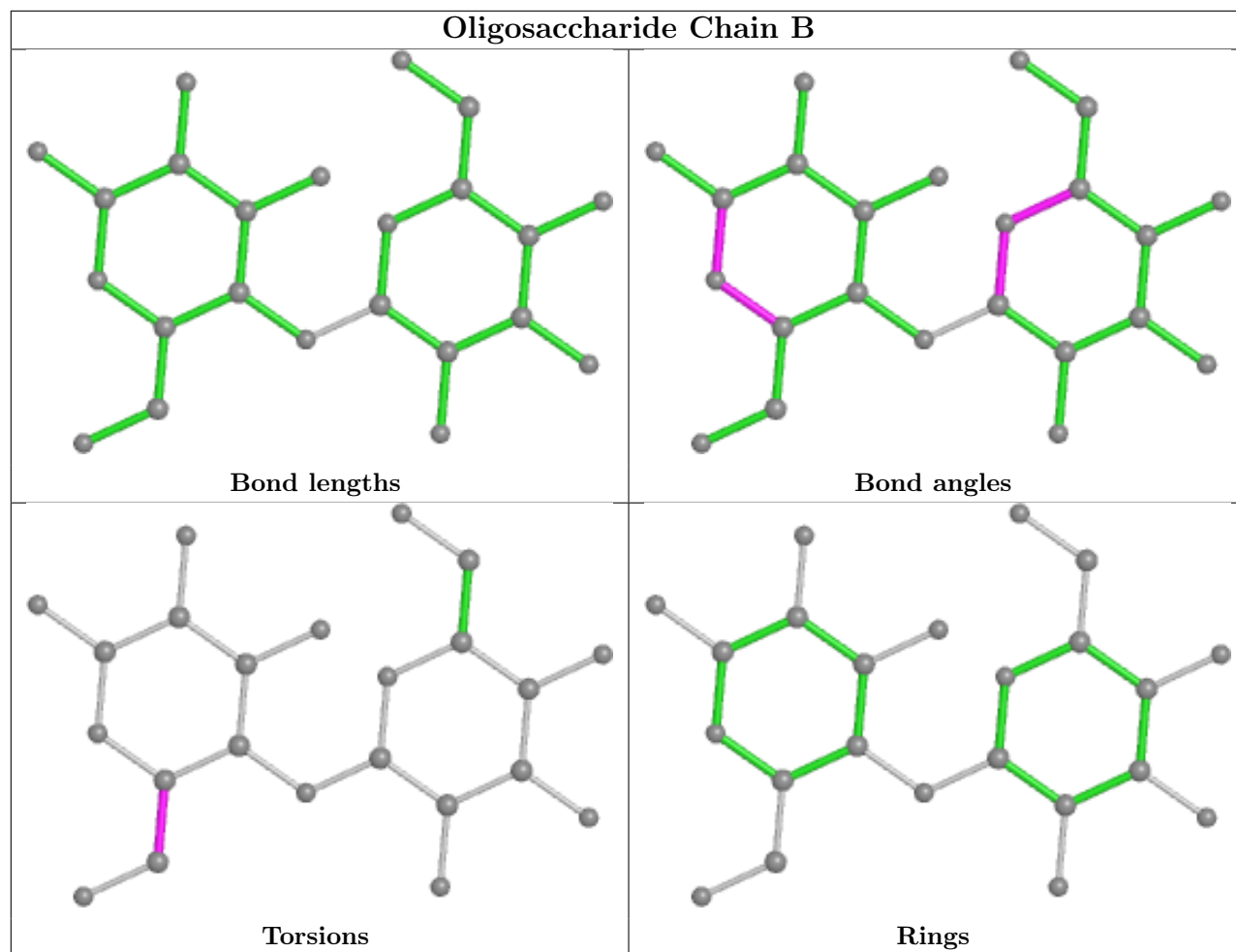
All (2) torsion outliers are listed below:

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, 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(Å ²)	Q<0.9
1	A	457/476 (96%)	0.93	78 (17%) 1 1	78, 93, 102, 112	0

All (78) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	-347	ILE	7.5
1	A	35	LEU	7.1
1	A	-318	THR	6.4
1	A	-344	GLY	5.8
1	A	36	ALA	5.4
1	A	-209	LYS	5.0
1	A	106	LEU	4.8
1	A	37	SER	4.8
1	A	-210	LEU	4.7
1	A	-348	LYS	4.7
1	A	-207	LYS	4.6
1	A	-228	LEU	4.6
1	A	-316	ILE	4.5
1	A	-205	LYS	4.5
1	A	-346	GLU	4.3
1	A	-201	MET	4.3
1	A	-130	LYS	4.1
1	A	-208	ALA	4.1
1	A	107	ASN	3.8
1	A	-317	GLY	3.7
1	A	-315	LYS	3.7
1	A	-36	LYS	3.6
1	A	-240	ALA	3.6
1	A	-86	SER	3.5
1	A	-325	GLY	3.5
1	A	-324	LYS	3.4
1	A	-176	ASN	3.4

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Mol	Chain	Res	Type	RSRZ
1	A	-286	ALA	3.4
1	A	-71	GLU	3.3
1	A	-85	ALA	3.3
1	A	-147	LYS	3.2
1	A	-111	SER	3.2
1	A	-283	ARG	3.2
1	A	-287	TRP	3.1
1	A	-194	TYR	3.1
1	A	-170	LYS	3.1
1	A	-214	LEU	3.1
1	A	-87	LEU	3.1
1	A	-126	ALA	3.1
1	A	-66	TYR	3.0
1	A	-288	PHE	3.0
1	A	-231	ASN	3.0
1	A	-295	GLY	2.9
1	A	-345	GLU	2.9
1	A	-12	SER	2.8
1	A	-306	LEU	2.8
1	A	-89	GLY	2.7
1	A	-220	TRP	2.7
1	A	-285	HIS	2.7
1	A	-174	LYS	2.7
1	A	-305	GLU	2.6
1	A	108	GLU	2.6
1	A	-125	MET	2.5
1	A	-343	LYS	2.5
1	A	-108	ASN	2.4
1	A	-110	LYS	2.4
1	A	-222	LYS	2.4
1	A	-238	GLU	2.4
1	A	-177	GLU	2.4
1	A	-232	TYR	2.4
1	A	-241	ILE	2.3
1	A	-281	GLY	2.3
1	A	-284	ASP	2.3
1	A	-74	LEU	2.3
1	A	-9	TRP	2.3
1	A	-237	ALA	2.3
1	A	-146	HIS	2.2
1	A	-97	GLY	2.2
1	A	-88	VAL	2.2

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Mol	Chain	Res	Type	RSRZ
1	A	-320	LYS	2.1
1	A	-319	ASP	2.1
1	A	-217	ILE	2.1
1	A	-211	GLU	2.1
1	A	105	ILE	2.1
1	A	-206	GLY	2.1
1	A	-239	VAL	2.1
1	A	-165	ASP	2.1
1	A	-98	LYS	2.0

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

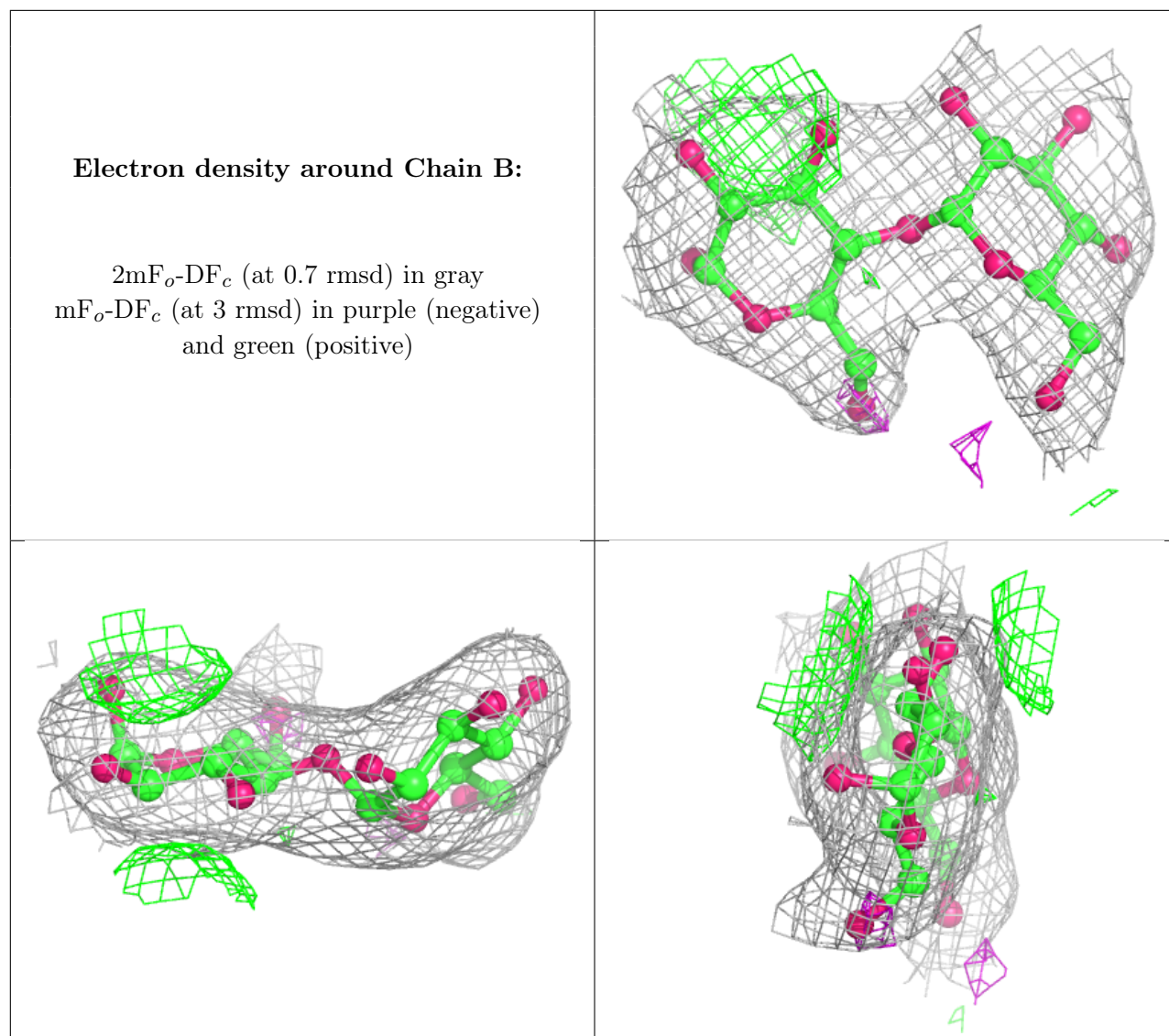
There are no non-standard protein/DNA/RNA residues in this entry.

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, 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	GLC	B	1	12/12	0.96	0.34	91,92,95,96	0
2	GLC	B	2	11/12	0.97	0.32	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.