



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 8, 2026 – 11:54 AM UTC

PDB ID : 4BFI / pdb_00004bfi
Title : Structure of the complex of the extracellular portions of mouse CD200R and mouse CD200
Authors : Hatherley, D.; Lea, S.M.; Johnson, S.; Barclay, A.N.
Deposited on : 2013-03-19
Resolution : 3.22 Å (reported)

This is a wwPDB X-ray Structure Validation Summary 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 : 4-5-2 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

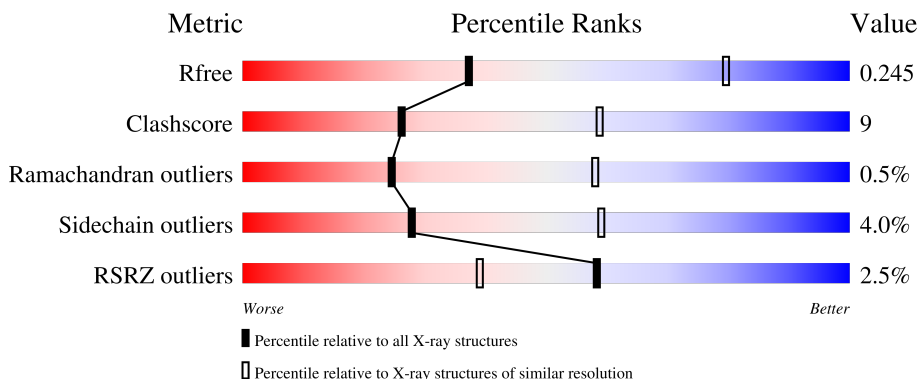
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 3.22 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	1768 (3.24-3.20)
Clashscore	190562	1879 (3.24-3.20)
Ramachandran outliers	187476	1844 (3.24-3.20)
Sidechain outliers	187428	1843 (3.24-3.20)
RSRZ outliers	180081	1768 (3.24-3.20)

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	216	 4% 77% 10% 12%
2	B	211	 4% 69% 24%

2 Entry composition i

There are 6 unique types of molecules in this entry. The entry contains 3220 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 CELL SURFACE GLYCOPROTEIN CD200 RECEPTOR 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	191	1449	904	243	292	10	0	0	0

There are 13 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	205	GLY	-	expression tag	UNP Q9ES57
A	206	ARG	-	expression tag	UNP Q9ES57
A	207	GLY	-	expression tag	UNP Q9ES57
A	208	GLY	-	expression tag	UNP Q9ES57
A	209	SER	-	expression tag	UNP Q9ES57
A	210	THR	-	expression tag	UNP Q9ES57
A	211	ARG	-	expression tag	UNP Q9ES57
A	212	HIS	-	expression tag	UNP Q9ES57
A	213	HIS	-	expression tag	UNP Q9ES57
A	214	HIS	-	expression tag	UNP Q9ES57
A	215	HIS	-	expression tag	UNP Q9ES57
A	216	HIS	-	expression tag	UNP Q9ES57
A	217	HIS	-	expression tag	UNP Q9ES57

- Molecule 2 is a protein called OX-2 MEMBRANE GLYCOPROTEIN.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	202	1579	997	268	306	8	0	0	0

There are 9 discrepancies between the modelled and reference sequences:

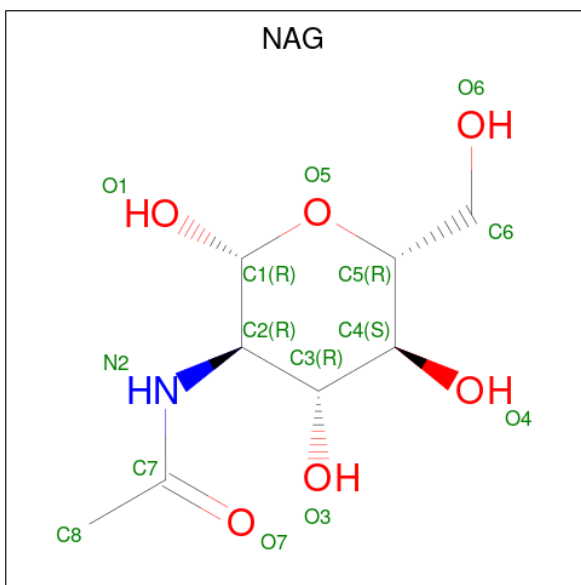
Chain	Residue	Modelled	Actual	Comment	Reference
B	203	SER	-	expression tag	UNP O54901
B	204	THR	-	expression tag	UNP O54901
B	205	ARG	-	expression tag	UNP O54901

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Chain	Residue	Modelled	Actual	Comment	Reference
B	206	HIS	-	expression tag	UNP O54901
B	207	HIS	-	expression tag	UNP O54901
B	208	HIS	-	expression tag	UNP O54901
B	209	HIS	-	expression tag	UNP O54901
B	210	HIS	-	expression tag	UNP O54901
B	211	HIS	-	expression tag	UNP O54901

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



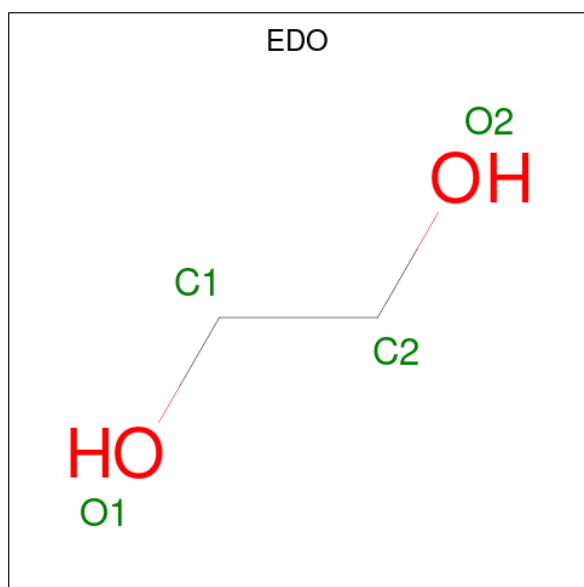
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
3	A	1	Total	C	N	O	0	0
			14	8	1	5		
3	A	1	Total	C	N	O	0	0
			14	8	1	5		
3	A	1	Total	C	N	O	0	0
			14	8	1	5		
3	A	1	Total	C	N	O	0	0
			14	8	1	5		
3	B	1	Total	C	N	O	0	0
			14	8	1	5		
3	B	1	Total	C	N	O	0	0
			14	8	1	5		
3	B	1	Total	C	N	O	0	0
	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

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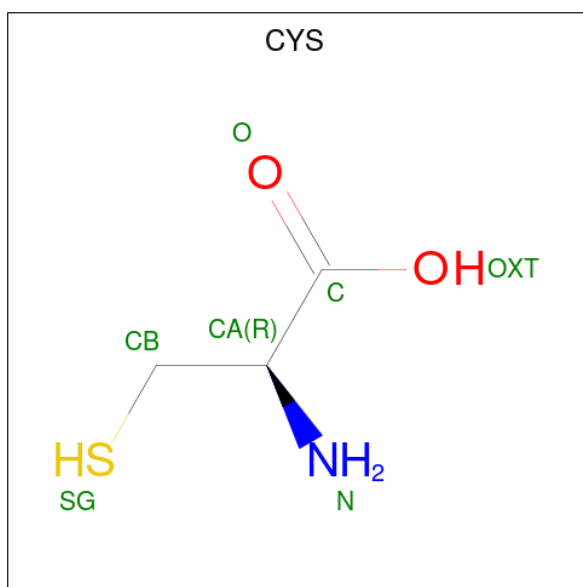
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
3	B	1	Total	C	N	O	0	0
			14	8	1	5		
3	B	1	Total	C	N	O	0	0
			14	8	1	5		
3	B	1	Total	C	N	O	0	0
			14	8	1	5		

- Molecule 4 is 1,2-ETHANEDIOL (CCD ID: EDO) (formula: C₂H₆O₂).



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

- Molecule 5 is CYSTEINE (CCD ID: CYS) (formula: C₃H₇NO₂S).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	S		
5	A	1	7	3	1	2	1	0	0

- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	23	Total	O	0	0
			23	23		
6	B	4	Total	O	0	0
			4	4		

4 Data and refinement statistics

Property	Value	Source
Space group	P 43 21 2	Depositor
Cell constants a, b, c, α , β , γ	128.17Å 128.17Å 116.08Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	86.04 – 3.22 86.04 – 3.22	Depositor EDS
% Data completeness (in resolution range)	99.3 (86.04-3.22) 99.5 (86.04-3.22)	Depositor EDS
R_{merge}	0.12	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.10 (at 3.19Å)	Xtrriage
Refinement program	REFMAC 5.6.0117	Depositor
R, R_{free}	0.199 , 0.251 0.197 , 0.245	Depositor DCC
R_{free} test set	819 reflections (5.09%)	wwPDB-VP
Wilson B-factor (Å ²)	83.9	Xtrriage
Anisotropy	0.621	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.31 , 54.6	EDS
L-test for twinning ²	$\langle L \rangle = 0.47$, $\langle L^2 \rangle = 0.30$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	3220	wwPDB-VP
Average B, all atoms (Å ²)	94.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.04% 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: NAG, EDO

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	0.68	0/1479	0.88	2/2025 (0.1%)
2	B	0.70	0/1613	0.91	5/2195 (0.2%)
All	All	0.69	0/3092	0.89	7/4220 (0.2%)

There are no bond length outliers.

The worst 5 of 7 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	173	ASP	CA-C-N	7.31	128.98	119.84
2	B	173	ASP	C-N-CA	7.31	128.98	119.84
2	B	122	PHE	CA-C-N	-6.09	112.30	122.17
2	B	122	PHE	C-N-CA	-6.09	112.30	122.17
1	A	83	THR	CA-C-N	-5.52	114.27	119.85

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	1449	0	1413	18	0
2	B	1579	0	1554	41	0
3	A	70	0	65	1	0
3	B	84	0	78	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
4	A	4	0	6	0	0
5	A	7	0	3	0	0
6	A	23	0	0	0	0
6	B	4	0	0	0	0
All	All	3220	0	3119	59	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 9.

The worst 5 of 59 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)
2:B:173:ASP:OD1	2:B:174:PRO:HD2	1.72	0.90
1:A:139:VAL:HG22	1:A:176:THR:HG22	1.60	0.83
1:A:71:THR:HG22	1:A:73:CYS:H	1.43	0.83
2:B:125:HIS:HB3	2:B:172:LYS:O	1.79	0.81
2:B:27:GLN:HG3	2:B:95:THR:HG21	1.60	0.81

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	189/216 (88%)	184 (97%)	5 (3%)	0	100	100
2	B	200/211 (95%)	181 (90%)	17 (8%)	2 (1%)	12	44
All	All	389/427 (91%)	365 (94%)	22 (6%)	2 (0%)	24	58

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	B	149	ILE
2	B	40	VAL

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	171/194 (88%)	165 (96%)	6 (4%)	32 61
2	B	181/190 (95%)	173 (96%)	8 (4%)	25 56
All	All	352/384 (92%)	338 (96%)	14 (4%)	28 59

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

Mol	Chain	Res	Type
2	B	74	SER
2	B	108	THR
2	B	189	LEU
2	B	154	GLU
2	B	171	VAL

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	178	HIS
1	A	198	GLN
2	B	35	GLN
2	B	118	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](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

13 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
3	NAG	A	2000	1	14,14,15	0.72	1 (7%)	17,19,21	2.11	2 (11%)
3	NAG	A	770	1	14,14,15	0.64	0	17,19,21	0.87	0
3	NAG	B	1270	2	14,14,15	0.94	1 (7%)	17,19,21	2.19	1 (5%)
4	EDO	A	1206	-	3,3,3	0.33	0	2,2,2	0.70	0
3	NAG	B	1510	2	14,14,15	0.53	0	17,19,21	1.41	2 (11%)
3	NAG	A	1970	1	14,14,15	0.68	0	17,19,21	0.96	1 (5%)
3	NAG	B	730	2	14,14,15	0.63	0	17,19,21	1.22	3 (17%)
3	NAG	A	690	1	14,14,15	0.68	0	17,19,21	1.29	1 (5%)
3	NAG	B	650	2	14,14,15	0.61	0	17,19,21	0.85	0
5	CYS	A	1207	1	5,6,6	1.04	1 (20%)	3,7,7	1.72	1 (33%)
3	NAG	B	1600	2	14,14,15	0.46	0	17,19,21	1.33	1 (5%)
3	NAG	B	800	2	14,14,15	0.52	0	17,19,21	1.02	2 (11%)
3	NAG	A	1680	1	14,14,15	0.44	0	17,19,21	2.59	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	2000	1	-	2/6/23/26	0/1/1/1
3	NAG	A	770	1	-	2/6/23/26	0/1/1/1
3	NAG	B	1270	2	-	0/6/23/26	0/1/1/1
4	EDO	A	1206	-	-	1/1/1/1	-
3	NAG	B	1510	2	-	1/6/23/26	0/1/1/1
3	NAG	A	1970	1	-	0/6/23/26	0/1/1/1
3	NAG	B	730	2	-	2/6/23/26	0/1/1/1
3	NAG	A	690	1	-	2/6/23/26	0/1/1/1
3	NAG	B	650	2	-	2/6/23/26	0/1/1/1
5	CYS	A	1207	1	-	3/6/6/6	-
3	NAG	B	1600	2	-	1/6/23/26	0/1/1/1
3	NAG	B	800	2	-	3/6/23/26	0/1/1/1
3	NAG	A	1680	1	-	1/6/23/26	0/1/1/1

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	B	1270	NAG	C1-C2	3.02	1.56	1.52
3	A	2000	NAG	C1-C2	2.34	1.55	1.52
5	A	1207	CYS	OXT-C	-2.10	1.23	1.30

The worst 5 of 18 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	B	1270	NAG	C1-O5-C5	8.33	123.34	112.19
3	A	2000	NAG	C1-O5-C5	7.13	121.75	112.19
3	A	1680	NAG	C4-C3-C2	-5.79	102.53	111.02
3	A	1680	NAG	O5-C1-C2	-5.46	102.84	111.29
3	A	1680	NAG	C2-N2-C7	5.04	129.65	122.90

There are no chirality outliers.

5 of 20 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	B	730	NAG	O5-C5-C6-O6
3	B	730	NAG	C4-C5-C6-O6
3	A	690	NAG	O5-C5-C6-O6
3	A	770	NAG	C4-C5-C6-O6
3	B	650	NAG	C4-C5-C6-O6

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	2000	NAG	1	0

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 [i](#)

6.1 Protein, DNA and RNA chains [i](#)

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	191/216 (88%)	-0.45	2 (1%) 79 62	57, 74, 106, 134	0
2	B	202/211 (95%)	0.15	8 (3%) 42 26	63, 105, 156, 176	0
All	All	393/427 (92%)	-0.15	10 (2%) 58 39	57, 84, 148, 176	0

The worst 5 of 10 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	205	GLY	5.5
1	A	15	PRO	3.6
2	B	122	PHE	3.1
2	B	118	HIS	2.9
2	B	203	SER	2.8

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](#)

There are no oligosaccharides in this entry.

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, 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(\AA^2)	Q<0.9
3	NAG	B	800	14/15	0.68	0.16	114,134,144,144	0
3	NAG	B	1270	14/15	0.76	0.20	155,170,177,178	0
5	CYS	A	1207	7/7	0.76	0.12	129,130,137,142	0
3	NAG	B	1600	14/15	0.78	0.13	123,135,139,140	0
3	NAG	A	1970	14/15	0.81	0.12	114,118,127,130	0
3	NAG	B	1510	14/15	0.82	0.11	140,160,164,164	0
3	NAG	A	2000	14/15	0.83	0.12	87,103,113,114	0
3	NAG	B	730	14/15	0.86	0.10	101,107,114,120	0
3	NAG	A	690	14/15	0.86	0.16	119,132,136,136	0
4	EDO	A	1206	4/4	0.93	0.20	63,63,68,75	0
3	NAG	A	770	14/15	0.93	0.12	101,108,116,116	0
3	NAG	B	650	14/15	0.95	0.08	95,102,103,105	0
3	NAG	A	1680	14/15	0.95	0.08	71,77,79,80	0

6.5 Other polymers [i](#)

There are no such residues in this entry.