



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 6, 2026 – 11:59 PM UTC

PDB ID : 6XCJ / pdb_00006xcj
Title : Crystal Structure of DH650 Fab from a Rhesus Macaque in Complex with HIV-1 gp120 Core
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Deposited on : 2020-06-08
Resolution : 2.80 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	:	4-5-2 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

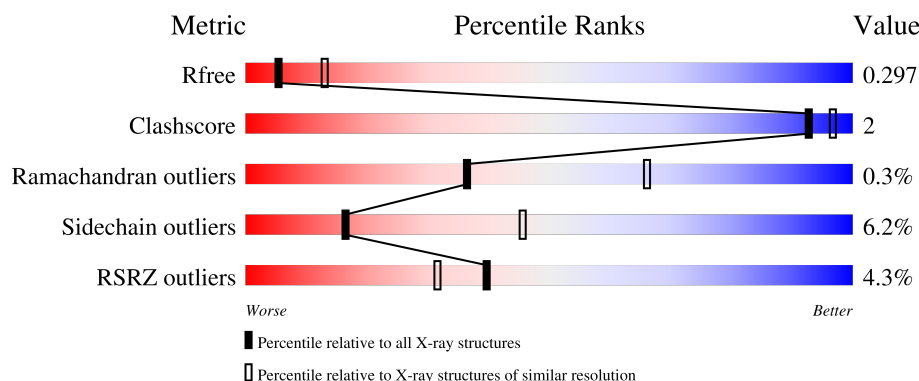
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.80 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	3866 (2.80-2.80)
Clashscore	190562	4276 (2.80-2.80)
Ramachandran outliers	187476	4196 (2.80-2.80)
Sidechain outliers	187428	4198 (2.80-2.80)
RSRZ outliers	180081	3869 (2.80-2.80)

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	G	357	
2	H	226	
3	L	220	

2 Entry composition [i](#)

There are 5 unique types of molecules in this entry. The entry contains 11296 atoms, of which 5584 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 Envelope Glycoprotein gp120.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
			Total	C	H	N	O	S			
1	G	279	4356	1380	2163	380	415	18	0	0	0

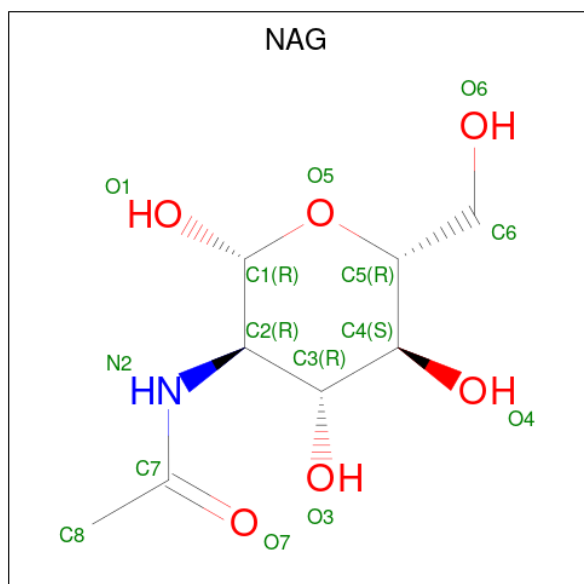
- Molecule 2 is a protein called DH650 Fab Heavy Chain.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
			Total	C	H	N	O	S			
2	H	223	3352	1062	1669	290	324	7	0	0	0

- Molecule 3 is a protein called DH650 Fab Light Chain.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
			Total	C	H	N	O	S			
3	L	219	3324	1057	1635	281	345	6	0	0	0

- Molecule 4 is 2-acetamido-2-deoxy-beta-D-glucopyranose (CCD ID: NAG) (formula: $C_8H_{15}NO_6$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
4	G	1	Total	C	H	N	O	0	0
			27	8	13	1	5		
4	G	1	Total	C	H	N	O	0	0
			27	8	13	1	5		
4	G	1	Total	C	H	N	O	0	0
			27	8	13	1	5		
4	G	1	Total	C	H	N	O	0	0
			27	8	13	1	5		
4	G	1	Total	C	H	N	O	0	0
			27	8	13	1	5		
4	G	1	Total	C	H	N	O	0	0
			27	8	13	1	5		
4	G	1	Total	C	H	N	O	0	0
			27	8	13	1	5		
4	G	1	Total	C	H	N	O	0	0
			27	8	13	1	5		

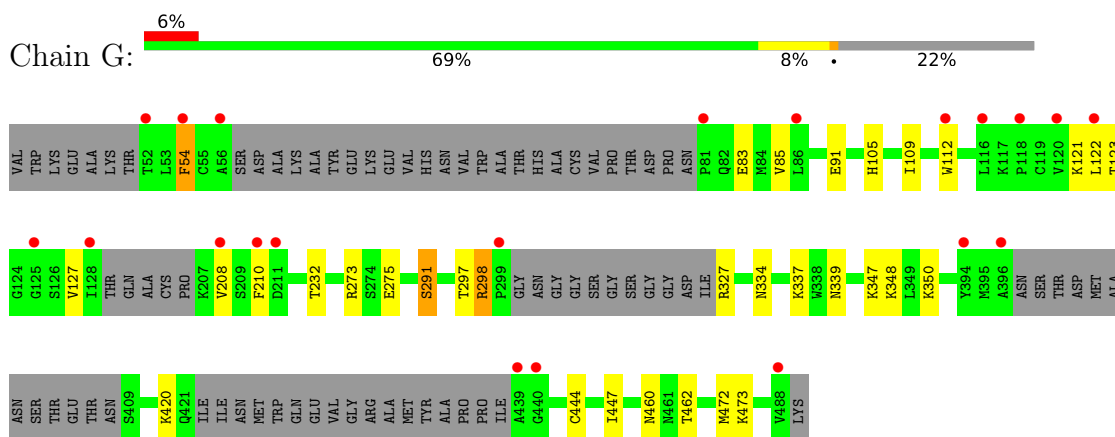
- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	G	3	Total	O	0	0
			3	3		
5	H	9	Total	O	0	0
			9	9		
5	L	9	Total	O	0	0
			9	9		

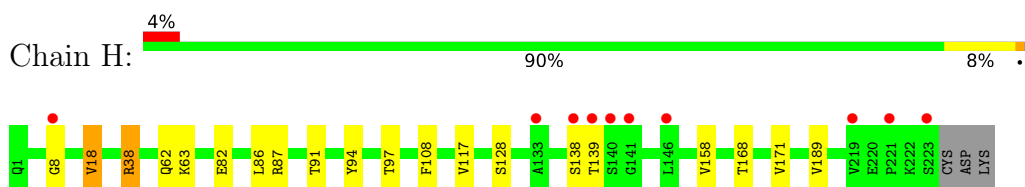
3 Residue-property plots

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.

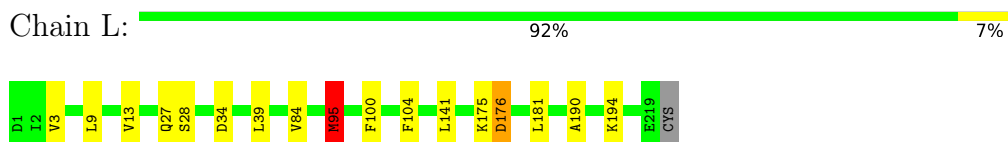
• Molecule 1: Envelope Glycoprotein gp120



• Molecule 2: DH650 Fab Heavy Chain



• Molecule 3: DH650 Fab Light Chain



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 2	Depositor
Cell constants a, b, c, α , β , γ	138.52Å 122.10Å 53.40Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	48.93 – 2.80 48.93 – 2.80	Depositor EDS
% Data completeness (in resolution range)	87.0 (48.93-2.80) 87.0 (48.93-2.80)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.45 (at 2.81Å)	Xtriage
Refinement program	BUSTER 2.10.3	Depositor
R, R_{free}	0.227 , 0.284 0.233 , 0.297	Depositor DCC
R_{free} test set	1009 reflections (5.03%)	wwPDB-VP
Wilson B-factor (Å ²)	55.4	Xtriage
Anisotropy	0.050	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.39 , 37.5	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.91	EDS
Total number of atoms	11296	wwPDB-VP
Average B, all atoms (Å ²)	58.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.90% 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

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	G	0.78	1/2232 (0.0%)	0.98	4/3014 (0.1%)
2	H	0.79	0/1723	0.93	0/2343
3	L	0.77	1/1725 (0.1%)	0.93	3/2343 (0.1%)
All	All	0.78	2/5680 (0.0%)	0.95	7/7700 (0.1%)

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	L	95	MET	SD-CE	-5.55	1.65	1.79
1	G	298	ARG	CA-C	5.06	1.59	1.52

All (7) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	G	54	PHE	CA-CB-CG	7.16	120.96	113.80
3	L	176	ASP	CA-CB-CG	6.62	119.22	112.60
1	G	339	ASN	OD1-CG-ND2	-5.71	116.89	122.60
1	G	339	ASN	CB-CG-ND2	5.68	124.93	116.40
3	L	100	PHE	CA-CB-CG	5.43	119.23	113.80
3	L	34	ASP	CA-CB-CG	5.40	118.00	112.60
1	G	123	THR	N-CA-C	-5.10	106.15	112.93

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	G	2193	2163	2163	8	0
2	H	1683	1669	1669	5	1
3	L	1689	1635	1635	5	0
4	G	126	117	117	2	0
5	G	3	0	0	0	0
5	H	9	0	0	0	0
5	L	9	0	0	0	0
All	All	5712	5584	5584	17	1

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 2.

All (17) 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:G:105:HIS:ND1	1:G:472:MET:HE2	2.10	0.67
2:H:38:ARG:NH1	2:H:94:TYR:OH	2.30	0.63
1:G:208:VAL:O	1:G:208:VAL:HG12	2.02	0.60
3:L:190:ALA:O	3:L:194:LYS:HG2	2.08	0.53
3:L:95:MET:HE3	3:L:104:PHE:CZ	2.45	0.52
2:H:97:THR:OG1	2:H:108:PHE:HB3	2.11	0.51
1:G:291:SER:HB2	1:G:447:ILE:HD11	1.94	0.49
2:H:189:VAL:HG21	3:L:141:LEU:HD22	1.94	0.49
2:H:18:VAL:HG22	2:H:86:LEU:HD11	1.97	0.47
1:G:85:VAL:HG21	4:G:503:NAG:H61	1.96	0.47
4:G:505:NAG:O6	3:L:28:SER:O	2.29	0.46
1:G:105:HIS:O	1:G:109:ILE:HG12	2.15	0.46
1:G:232:THR:O	1:G:232:THR:HG22	2.17	0.44
3:L:13:VAL:HG11	3:L:84:VAL:HG21	2.02	0.42
1:G:334:ASN:HD22	1:G:337:LYS:HB2	1.85	0.42
2:H:91:THR:HA	2:H:117:VAL:O	2.20	0.42
1:G:208:VAL:HG13	1:G:210:PHE:CE2	2.56	0.41

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:H:87:ARG:HH11	2:H:87:ARG:HH11[2_555]	1.31	0.29

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	G	267/357 (75%)	248 (93%)	18 (7%)	1 (0%)	30	60
2	H	221/226 (98%)	204 (92%)	16 (7%)	1 (0%)	24	55
3	L	217/220 (99%)	208 (96%)	9 (4%)	0	100	100
All	All	705/803 (88%)	660 (94%)	43 (6%)	2 (0%)	36	66

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	G	460	ASN
2	H	8	GLY

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	G	252/314 (80%)	232 (92%)	20 (8%)	11	35
2	H	187/190 (98%)	176 (94%)	11 (6%)	18	48
3	L	193/194 (100%)	185 (96%)	8 (4%)	27	62
All	All	632/698 (90%)	593 (94%)	39 (6%)	16	45

All (39) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	G	54	PHE

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Mol	Chain	Res	Type
1	G	83	GLU
1	G	91	GLU
1	G	112	TRP
1	G	121	LYS
1	G	122	LEU
1	G	127	VAL
1	G	273	ARG
1	G	275	GLU
1	G	291	SER
1	G	297	THR
1	G	298	ARG
1	G	327	ARG
1	G	347	LYS
1	G	348	LYS
1	G	350	LYS
1	G	420	LYS
1	G	444	CYS
1	G	462	THR
1	G	473	LYS
2	H	18	VAL
2	H	38	ARG
2	H	62	GLN
2	H	63	LYS
2	H	82	GLU
2	H	128	SER
2	H	138	SER
2	H	139	THR
2	H	158	VAL
2	H	168	THR
2	H	171	VAL
3	L	3	VAL
3	L	9	LEU
3	L	27	GLN
3	L	39	LEU
3	L	95	MET
3	L	175	LYS
3	L	176	ASP
3	L	181	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
1	G	332	ASN
3	L	143	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 ⓘ

There are no oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

9 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	$\# Z > 2$
4	NAG	G	501	1	14,14,15	0.22	0	17,19,21	0.78	1 (5%)
4	NAG	G	508	1	14,14,15	0.54	0	17,19,21	1.68	3 (17%)
4	NAG	G	505	1	14,14,15	0.33	0	17,19,21	0.69	1 (5%)
4	NAG	G	509	1	14,14,15	0.26	0	17,19,21	0.93	1 (5%)
4	NAG	G	503	1	14,14,15	0.35	0	17,19,21	1.06	3 (17%)
4	NAG	G	506	1	14,14,15	0.37	0	17,19,21	0.98	1 (5%)
4	NAG	G	502	1	14,14,15	0.30	0	17,19,21	1.90	4 (23%)
4	NAG	G	507	1	14,14,15	0.30	0	17,19,21	0.68	0
4	NAG	G	504	1	14,14,15	0.28	0	17,19,21	1.09	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
4	NAG	G	501	1	-	0/6/23/26	0/1/1/1
4	NAG	G	508	1	-	1/6/23/26	0/1/1/1
4	NAG	G	505	1	-	2/6/23/26	0/1/1/1
4	NAG	G	509	1	-	0/6/23/26	0/1/1/1
4	NAG	G	503	1	-	3/6/23/26	0/1/1/1
4	NAG	G	506	1	-	4/6/23/26	0/1/1/1
4	NAG	G	502	1	-	2/6/23/26	0/1/1/1
4	NAG	G	507	1	-	0/6/23/26	0/1/1/1
4	NAG	G	504	1	-	0/6/23/26	0/1/1/1

There are no bond length outliers.

All (15) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	G	502	NAG	O5-C1-C2	-4.79	103.88	111.29
4	G	508	NAG	C1-O5-C5	4.59	118.34	112.19
4	G	502	NAG	C1-C2-N2	4.46	117.46	110.43
4	G	508	NAG	C1-C2-N2	-4.22	103.78	110.43
4	G	504	NAG	C1-O5-C5	3.45	116.81	112.19
4	G	506	NAG	C1-C2-N2	3.19	115.45	110.43
4	G	503	NAG	C1-C2-N2	3.13	115.36	110.43
4	G	509	NAG	C1-C2-N2	-2.92	105.84	110.43
4	G	502	NAG	C2-N2-C7	2.68	126.50	122.90
4	G	502	NAG	C1-O5-C5	2.63	115.71	112.19
4	G	501	NAG	O5-C1-C2	-2.13	107.99	111.29
4	G	505	NAG	C1-C2-N2	-2.13	107.07	110.43
4	G	503	NAG	C2-N2-C7	2.09	125.69	122.90
4	G	508	NAG	O5-C1-C2	-2.06	108.10	111.29
4	G	503	NAG	O5-C1-C2	-2.02	108.17	111.29

There are no chirality outliers.

All (12) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	G	506	NAG	O5-C5-C6-O6
4	G	505	NAG	O5-C5-C6-O6
4	G	503	NAG	O5-C5-C6-O6
4	G	508	NAG	O5-C5-C6-O6

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Mol	Chain	Res	Type	Atoms
4	G	505	NAG	C4-C5-C6-O6
4	G	506	NAG	C1-C2-N2-C7
4	G	502	NAG	C3-C2-N2-C7
4	G	503	NAG	C3-C2-N2-C7
4	G	506	NAG	C4-C5-C6-O6
4	G	502	NAG	C1-C2-N2-C7
4	G	503	NAG	C1-C2-N2-C7
4	G	506	NAG	C3-C2-N2-C7

There are no ring outliers.

2 monomers are involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	G	505	NAG	1	0
4	G	503	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	G	279/357 (78%)	0.64	21 (7%) 20 15	35, 62, 99, 113	0
2	H	223/226 (98%)	0.29	10 (4%) 38 30	36, 52, 87, 103	0
3	L	219/220 (99%)	0.10	0 100 100	35, 51, 68, 80	0
All	All	721/803 (89%)	0.37	31 (4%) 40 31	35, 55, 91, 113	0

All (31) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	H	139	THR	4.4
1	G	208	VAL	4.1
2	H	223	SER	3.6
1	G	56	ALA	3.6
1	G	396	ALA	3.6
1	G	122	LEU	3.5
1	G	81	PRO	3.5
1	G	112	TRP	3.4
2	H	8	GLY	3.3
1	G	128	ILE	3.3
1	G	125	GLY	3.1
2	H	133	ALA	3.0
1	G	54	PHE	3.0
1	G	52	THR	2.9
1	G	116	LEU	2.8
1	G	439	ALA	2.8
1	G	299	PRO	2.7
1	G	210	PHE	2.7
2	H	141	GLY	2.7
2	H	138	SER	2.5
1	G	118	PRO	2.5
2	H	140	SER	2.5
2	H	146	LEU	2.4

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Mol	Chain	Res	Type	RSRZ
2	H	221	PRO	2.4
1	G	120	VAL	2.4
2	H	219	VAL	2.4
1	G	488	VAL	2.3
1	G	440	GLY	2.3
1	G	86	LEU	2.3
1	G	394	TYR	2.2
1	G	211	ASP	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](#)

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(Å ²)	Q<0.9
4	NAG	G	503	14/15	0.50	0.16	81,83,99,99	0
4	NAG	G	508	14/15	0.67	0.15	73,74,89,89	0
4	NAG	G	505	14/15	0.72	0.15	60,61,73,73	0
4	NAG	G	507	14/15	0.73	0.13	68,69,83,84	0
4	NAG	G	506	14/15	0.74	0.16	70,73,88,88	0
4	NAG	G	502	14/15	0.77	0.14	54,55,66,66	0
4	NAG	G	504	14/15	0.80	0.13	54,55,66,66	0
4	NAG	G	501	14/15	0.82	0.12	53,54,64,65	0
4	NAG	G	509	14/15	0.84	0.11	66,67,81,81	0

6.5 Other polymers [i](#)

There are no such residues in this entry.