



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 04:22 PM UTC

PDB ID : 6EZR / pdb_00006ezr
Title : Crystal structure of GH20 Exo beta-N-Acetylglucosaminidase from *Vibrio harveyi*
Authors : Porfetye, A.T.; Meekrathok, P.; Burger, M.; Vetter, I.R.; Suginta, W.
Deposited on : 2017-11-16
Resolution : 2.37 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
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

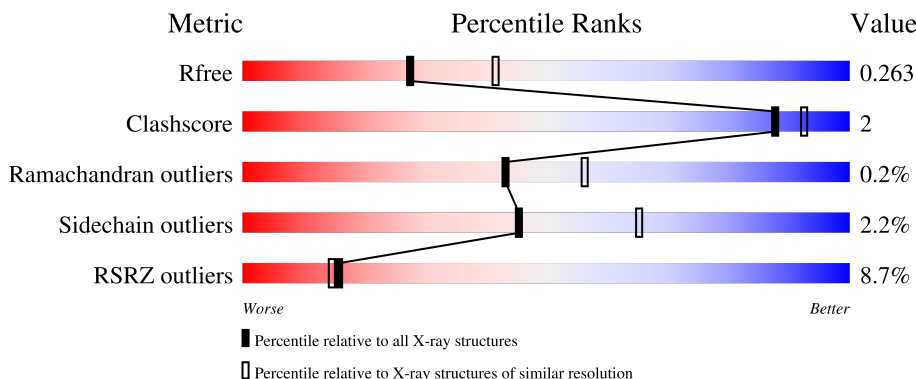
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.37 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	7164 (2.40-2.36)
Clashscore	190562	7722 (2.40-2.36)
Ramachandran outliers	187476	7626 (2.40-2.36)
Sidechain outliers	187428	7627 (2.40-2.36)
RSRZ outliers	180081	7170 (2.40-2.36)

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	652	8% 93% 5%
1	B	652	9% 92% 6%

2 Entry composition [i](#)

There are 2 unique types of molecules in this entry. The entry contains 11303 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 Beta-N-acetylglucosaminidase Nag2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	639	Total	C	N	O	S	0	7	0
			5197	3306	893	976	22			
1	B	639	Total	C	N	O	S	0	7	0
			5183	3298	885	978	22			

There are 20 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	643	ARG	-	expression tag	UNP D9ISE0
A	644	SER	-	expression tag	UNP D9ISE0
A	645	ARG	-	expression tag	UNP D9ISE0
A	646	SER	-	expression tag	UNP D9ISE0
A	647	HIS	-	expression tag	UNP D9ISE0
A	648	HIS	-	expression tag	UNP D9ISE0
A	649	HIS	-	expression tag	UNP D9ISE0
A	650	HIS	-	expression tag	UNP D9ISE0
A	651	HIS	-	expression tag	UNP D9ISE0
A	652	HIS	-	expression tag	UNP D9ISE0
B	643	ARG	-	expression tag	UNP D9ISE0
B	644	SER	-	expression tag	UNP D9ISE0
B	645	ARG	-	expression tag	UNP D9ISE0
B	646	SER	-	expression tag	UNP D9ISE0
B	647	HIS	-	expression tag	UNP D9ISE0
B	648	HIS	-	expression tag	UNP D9ISE0
B	649	HIS	-	expression tag	UNP D9ISE0
B	650	HIS	-	expression tag	UNP D9ISE0
B	651	HIS	-	expression tag	UNP D9ISE0
B	652	HIS	-	expression tag	UNP D9ISE0

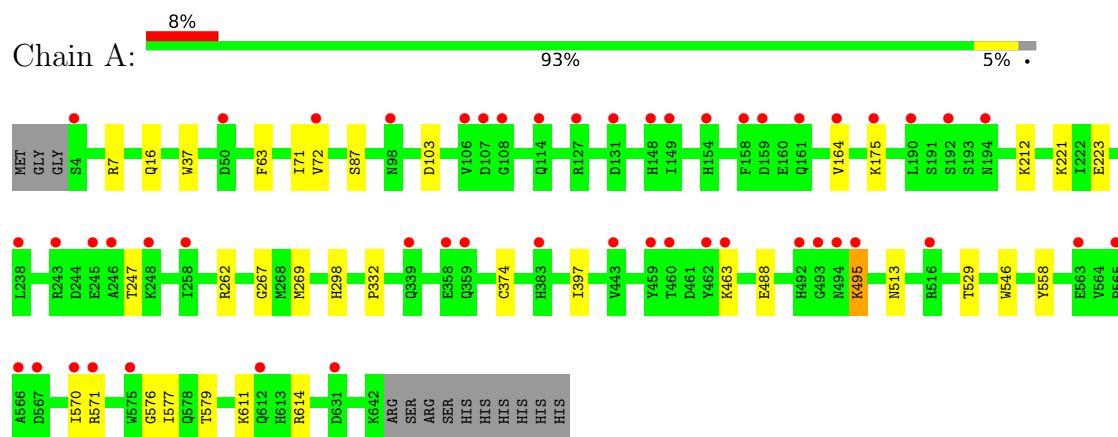
- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	435	Total 435	O 435	0	0
2	B	488	Total 488	O 488	0	0

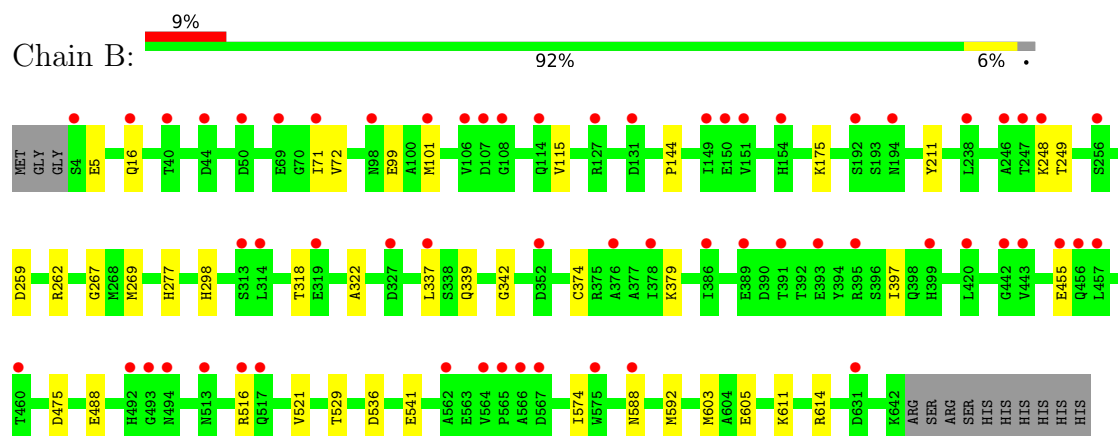
3 Residue-property plots [i](#)

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: Beta-N-acetylglucosaminidase Nag2



• Molecule 1: Beta-N-acetylglucosaminidase Nag2



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	90.15Å 130.71Å 98.48Å 90.00° 112.99° 90.00°	Depositor
Resolution (Å)	90.66 – 2.37 90.66 – 2.37	Depositor EDS
% Data completeness (in resolution range)	99.6 (90.66-2.37) 99.6 (90.66-2.37)	Depositor EDS
R_{merge}	0.15	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.26 (at 2.37Å)	Xtriage
Refinement program	REFMAC 5.8.0103	Depositor
R, R_{free}	0.214 , 0.259 0.222 , 0.263	Depositor DCC
R_{free} test set	4215 reflections (4.95%)	wwPDB-VP
Wilson B-factor (Å ²)	39.2	Xtriage
Anisotropy	0.437	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 38.7	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.93	EDS
Total number of atoms	11303	wwPDB-VP
Average B, all atoms (Å ²)	50.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 17.83% 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

5.1 Standard geometry

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	0.56	0/5350	0.81	1/7272 (0.0%)
1	B	0.56	0/5341	0.82	2/7262 (0.0%)
All	All	0.56	0/10691	0.81	3/14534 (0.0%)

There are no bond length outliers.

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	267	GLY	N-CA-C	5.54	119.23	111.14
1	B	267	GLY	N-CA-C	5.17	118.68	111.14
1	B	342	GLY	N-CA-C	5.09	116.92	110.20

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts

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	5197	0	5042	22	0
1	B	5183	0	5027	21	0
2	A	435	0	0	2	0
2	B	488	0	0	0	0
All	All	11303	0	10069	41	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 2.

All (41) 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:B:516[B]:ARG:HH21	1:B:516[B]:ARG:CG	1.84	0.89
1:B:516[B]:ARG:HH21	1:B:516[B]:ARG:HG3	1.39	0.86
1:A:7[B]:ARG:HG2	1:A:7[B]:ARG:HH11	1.66	0.60
1:B:516[B]:ARG:HG3	1:B:516[B]:ARG:NH2	2.09	0.60
1:A:7[B]:ARG:HG2	1:A:7[B]:ARG:NH1	2.21	0.56
1:B:605:GLU:HG2	1:B:614:ARG:HD3	1.91	0.52
1:A:571[B]:ARG:CG	1:A:571[B]:ARG:HH11	2.22	0.52
1:A:212:LYS:HB2	1:A:223:GLU:HB2	1.93	0.51
1:A:571[B]:ARG:HH11	1:A:571[B]:ARG:HB3	1.75	0.51
1:A:175:LYS:NZ	2:A:702:HOH:O	2.42	0.51
1:B:516[B]:ARG:CG	1:B:516[B]:ARG:NH2	2.55	0.50
1:B:529:THR:HG22	1:B:603:MET:CE	2.42	0.50
1:B:603:MET:HE3	1:B:603:MET:HA	1.94	0.49
1:B:516[B]:ARG:HH21	1:B:516[B]:ARG:HG2	1.72	0.49
1:A:16[B]:GLN:HG3	1:B:397:ILE:HD13	1.96	0.48
1:B:529:THR:HG22	1:B:603:MET:HE1	1.96	0.46
1:A:63:PHE:CD1	1:A:332:PRO:HG2	2.49	0.46
1:B:101:MET:HA	1:B:115:VAL:HG23	1.97	0.46
1:B:269:MET:HG3	1:B:298:HIS:CD2	2.51	0.45
1:A:611:LYS:NZ	2:A:704:HOH:O	2.49	0.45
1:A:397:ILE:HD13	1:B:16[B]:GLN:HG3	1.99	0.45
1:B:269:MET:HG3	1:B:298:HIS:CG	2.52	0.44
1:B:211:TYR:CE2	1:B:259:ASP:HB3	2.54	0.43
1:A:37:TRP:HA	1:A:103:ASP:O	2.20	0.42
1:B:536:ASP:HB3	1:B:541:GLU:HG3	2.01	0.42
1:B:144:PRO:HB3	1:B:605:GLU:HA	2.01	0.42
1:A:571[B]:ARG:CG	1:A:571[B]:ARG:NH1	2.82	0.41
1:A:571[B]:ARG:NH1	1:A:571[B]:ARG:HG2	2.35	0.41
1:A:571[B]:ARG:HH11	1:A:571[B]:ARG:CB	2.32	0.41
1:B:71:ILE:HG23	1:B:72:VAL:HG23	2.02	0.40
1:B:277:HIS:CG	1:B:592:MET:HE1	2.56	0.40
1:A:7[B]:ARG:HH11	1:A:7[B]:ARG:CG	2.29	0.40
1:A:558:TYR:O	1:A:614:ARG:NH2	2.52	0.40
1:B:318:THR:O	1:B:322:ALA:HB3	2.21	0.40
1:A:71:ILE:HG23	1:A:72:VAL:HG23	2.04	0.40
1:A:576:GLY:C	1:A:577:ILE:HD12	2.47	0.40
1:B:521:VAL:CG2	1:B:574:ILE:HD13	2.51	0.40
1:A:269:MET:HG3	1:A:298:HIS:CG	2.57	0.40
1:A:529:THR:HB	1:A:579:THR:HA	2.04	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	644/652 (99%)	628 (98%)	14 (2%)	2 (0%)	36	48
1	B	644/652 (99%)	626 (97%)	17 (3%)	1 (0%)	43	56
All	All	1288/1304 (99%)	1254 (97%)	31 (2%)	3 (0%)	43	56

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	488	GLU
1	B	488	GLU
1	A	495	LYS

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	563/567 (99%)	553 (98%)	10 (2%)	51	71
1	B	563/567 (99%)	549 (98%)	14 (2%)	42	61
All	All	1126/1134 (99%)	1102 (98%)	24 (2%)	45	67

All (24) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	87	SER
1	A	164	VAL
1	A	221	LYS
1	A	247	THR
1	A	262	ARG
1	A	374	CYS
1	A	463	LYS
1	A	495	LYS
1	A	513	ASN
1	A	570	ILE
1	B	5	GLU
1	B	99	GLU
1	B	175	LYS
1	B	248	LYS
1	B	249	THR
1	B	262	ARG
1	B	337	LEU
1	B	339	GLN
1	B	374	CYS
1	B	379	LYS
1	B	455	GLU
1	B	475	ASP
1	B	588	ASN
1	B	611	LYS

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	281	GLN
1	A	399	HIS
1	A	588	ASN
1	A	636	ASN
1	B	54	ASN
1	B	183	GLN
1	B	359	GLN
1	B	399	HIS
1	B	588	ASN

5.3.3 RNA ⓘ

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](#)

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	639/652 (98%)	0.84	50 (7%)	19 17	20, 48, 73, 109	7 (1%)
1	B	639/652 (98%)	0.89	61 (9%)	14 12	28, 47, 73, 104	7 (1%)
All	All	1278/1304 (98%)	0.86	111 (8%)	16 15	20, 48, 73, 109	14 (1%)

All (111) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	566	ALA	5.3
1	B	493	GLY	4.8
1	A	566	ALA	4.6
1	A	383[A]	HIS	4.3
1	A	493	GLY	3.6
1	B	565	PRO	3.6
1	A	565	PRO	3.5
1	A	494	ASN	3.4
1	A	108	GLY	3.4
1	B	631	ASP	3.4
1	A	516[A]	ARG	3.4
1	B	516[A]	ARG	3.3
1	A	4	SER	3.3
1	B	246	ALA	3.1
1	A	248	LYS	3.1
1	B	247	THR	3.1
1	A	246	ALA	3.1
1	A	631	ASP	3.1
1	B	106	VAL	3.1
1	B	567	ASP	3.0
1	A	463	LYS	2.9
1	B	575	TRP	2.9
1	A	443	VAL	2.9
1	A	194	ASN	2.9

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Mol	Chain	Res	Type	RSRZ
1	A	245	GLU	2.9
1	A	114	GLN	2.8
1	B	16[A]	GLN	2.8
1	A	148	HIS	2.8
1	B	69	GLU	2.8
1	B	248	LYS	2.8
1	A	154	HIS	2.7
1	B	327	ASP	2.7
1	B	391	THR	2.7
1	A	570	ILE	2.7
1	B	492	HIS	2.6
1	A	567	ASP	2.6
1	B	399	HIS	2.6
1	A	462	TYR	2.6
1	B	256	SER	2.6
1	A	175	LYS	2.6
1	B	107	ASP	2.6
1	B	151	VAL	2.6
1	A	107	ASP	2.5
1	A	192	SER	2.5
1	B	313	SER	2.5
1	A	190	LEU	2.5
1	B	562	ALA	2.5
1	A	164	VAL	2.5
1	B	127	ARG	2.5
1	A	238	LEU	2.5
1	B	101	MET	2.5
1	A	98	ASN	2.5
1	B	455	GLU	2.5
1	B	71	ILE	2.4
1	B	352	ASP	2.4
1	B	588	ASN	2.4
1	B	442	GLY	2.4
1	A	460	THR	2.4
1	B	192	SER	2.4
1	A	339	GLN	2.4
1	B	44[A]	ASP	2.4
1	B	393	GLU	2.4
1	B	108	GLY	2.4
1	B	238	LEU	2.4
1	A	50[A]	ASP	2.3
1	B	376	ALA	2.3

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Mol	Chain	Res	Type	RSRZ
1	A	149	ILE	2.3
1	A	127	ARG	2.3
1	A	159	ASP	2.3
1	B	564	VAL	2.3
1	B	494	ASN	2.3
1	A	72	VAL	2.3
1	A	158	PHE	2.3
1	B	337	LEU	2.3
1	B	513[A]	ASN	2.3
1	A	575	TRP	2.3
1	A	258	ILE	2.3
1	A	571[A]	ARG	2.2
1	A	459	TYR	2.2
1	A	492	HIS	2.2
1	A	358	GLU	2.2
1	A	161	GLN	2.2
1	B	40	THR	2.2
1	B	149	ILE	2.2
1	B	194	ASN	2.2
1	B	389	GLU	2.2
1	B	114	GLN	2.2
1	B	517	GLN	2.2
1	B	457	LEU	2.1
1	B	98[A]	ASN	2.1
1	B	443	VAL	2.1
1	A	495	LYS	2.1
1	A	563	GLU	2.1
1	B	460	THR	2.1
1	B	395	ARG	2.1
1	B	50[A]	ASP	2.1
1	B	456	GLN	2.1
1	A	243	ARG	2.1
1	B	4	SER	2.1
1	B	150	GLU	2.1
1	B	386	ILE	2.1
1	B	420	LEU	2.1
1	A	359	GLN	2.1
1	B	154	HIS	2.1
1	B	319	GLU	2.1
1	A	131	ASP	2.1
1	B	131	ASP	2.1
1	A	106	VAL	2.1

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Mol	Chain	Res	Type	RSRZ
1	A	612	GLN	2.0
1	B	314	LEU	2.0
1	B	378	ILE	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](#)

There are no oligosaccharides in this entry.

6.4 Ligands [i](#)

There are no ligands in this entry.

6.5 Other polymers [i](#)

There are no such residues in this entry.