



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 20, 2026 – 04:22 AM UTC

PDB ID : 5ZBI / pdb_00005zbi
Title : Crystal structure of asparaginyl endopeptidases from *Viola Canadensis*
Authors : Wong, Y.H.; Lescar, J.
Deposited on : 2018-02-12
Resolution : 2.09 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

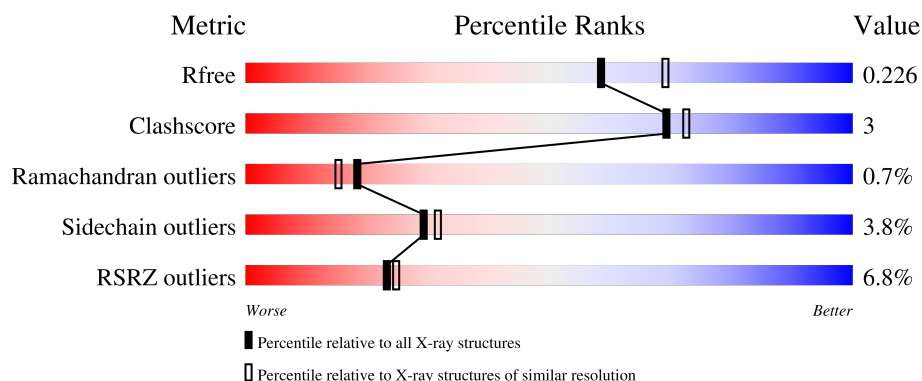
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.09 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	6658 (2.10-2.10)
Clashscore	190562	7164 (2.10-2.10)
Ramachandran outliers	187476	7099 (2.10-2.10)
Sidechain outliers	187428	7100 (2.10-2.10)
RSRZ outliers	180081	6662 (2.10-2.10)

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	532	
1	B	532	

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 7056 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 Peptide asparaginyl ligase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	420	Total	C	N	O	S	0	0	0
			3296	2090	552	635	19			
1	B	415	Total	C	N	O	S	0	0	0
			3261	2068	546	628	19			

- Molecule 2 is SODIUM ION (CCD ID: NA) (formula: Na).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	1	Total	Na	0	0
			1	1		

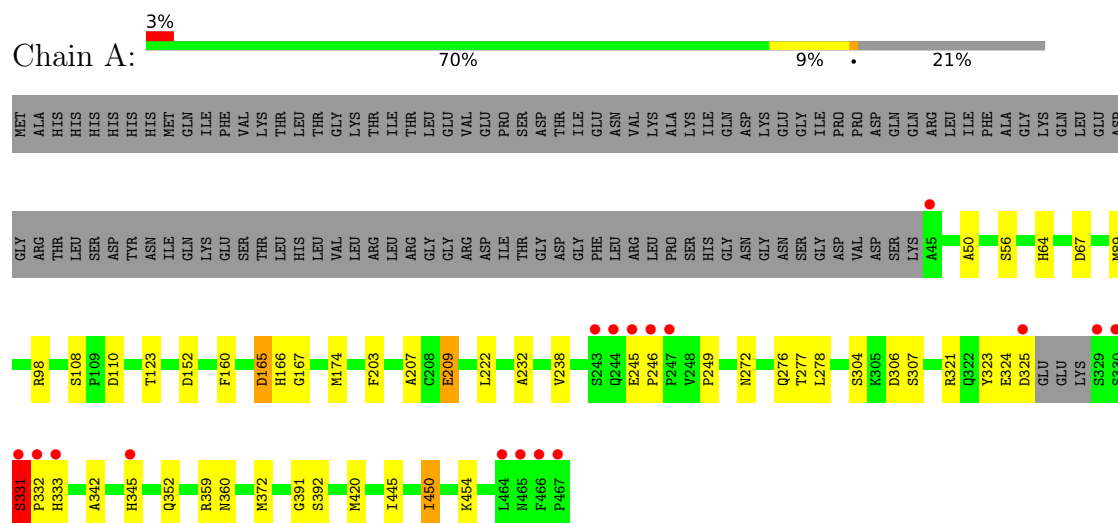
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	291	Total	O	0	0
			291	291		
3	B	207	Total	O	0	0
			207	207		

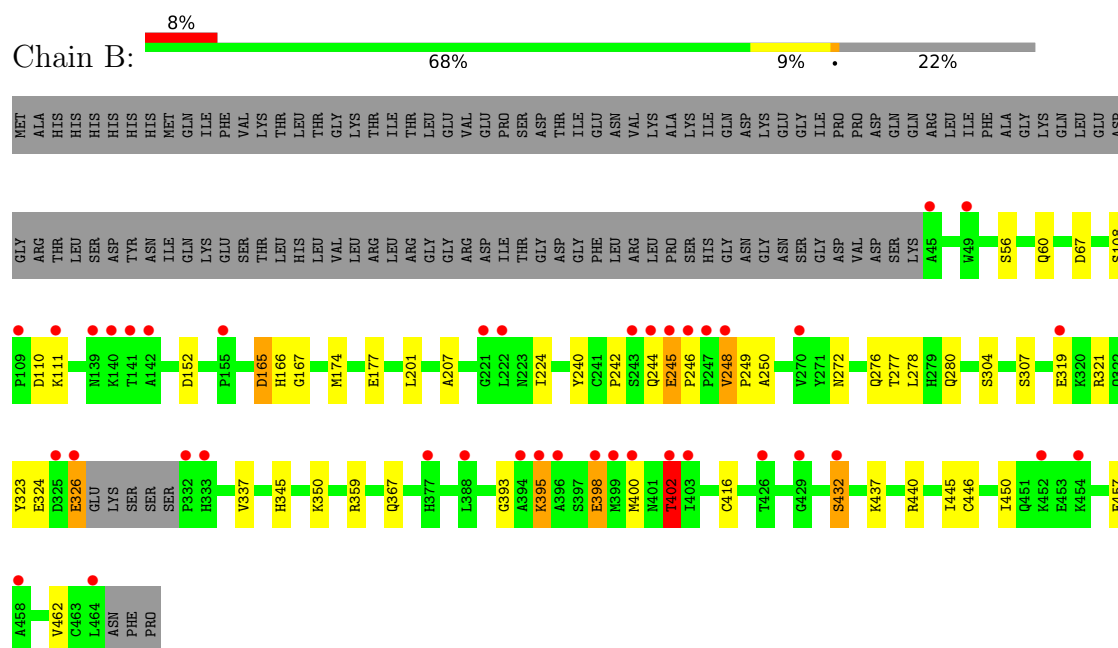
3 Residue-property plots [i](#)

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: Peptide asparaginyl ligase



- Molecule 1: Peptide asparaginyl ligase



4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	184.47Å 62.08Å 82.91Å 90.00° 106.81° 90.00°	Depositor
Resolution (Å)	44.42 – 2.09 44.42 – 2.09	Depositor EDS
% Data completeness (in resolution range)	99.4 (44.42-2.09) 99.7 (44.42-2.09)	Depositor EDS
R_{merge}	0.10	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.05 (at 2.10Å)	Xtriage
Refinement program	BUSTER 2.10.3	Depositor
R, R_{free}	0.189 , 0.225 0.188 , 0.226	Depositor DCC
R_{free} test set	2661 reflections (5.01%)	wwPDB-VP
Wilson B-factor (Å ²)	27.2	Xtriage
Anisotropy	0.567	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.38 , 54.9	EDS
L-test for twinning ²	$\langle L \rangle = 0.51$, $\langle L^2 \rangle = 0.34$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	7056	wwPDB-VP
Average B, all atoms (Å ²)	36.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.36% 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

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

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	0.90	3/3377 (0.1%)	1.21	15/4579 (0.3%)
1	B	0.83	1/3340 (0.0%)	1.26	11/4527 (0.2%)
All	All	0.87	4/6717 (0.1%)	1.24	26/9106 (0.3%)

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	174	MET	SD-CE	-12.30	1.48	1.79
1	A	372	MET	SD-CE	-7.27	1.61	1.79
1	A	450	ILE	CG1-CD1	-6.52	1.26	1.51
1	B	174	MET	SD-CE	-6.23	1.64	1.79

All (26) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	67	ASP	CA-CB-CG	6.40	119.00	112.60
1	B	398	GLU	CA-C-N	6.37	128.73	120.44
1	B	398	GLU	C-N-CA	6.37	128.73	120.44
1	A	272	ASN	N-CA-C	-6.26	100.14	109.15
1	B	272	ASN	N-CA-C	-6.25	100.15	109.15
1	B	67	ASP	CA-CB-CG	6.14	118.74	112.60
1	A	246	PRO	N-CA-C	-6.01	103.36	110.70
1	A	391	GLY	N-CA-C	5.85	123.12	115.40
1	B	402	THR	CA-C-N	5.85	130.64	123.10
1	B	402	THR	C-N-CA	5.85	130.64	123.10
1	A	110	ASP	CA-CB-CG	5.50	118.10	112.60
1	A	152	ASP	N-CA-C	-5.46	103.09	110.68
1	B	152	ASP	N-CA-C	-5.28	103.34	110.68
1	A	325	ASP	CA-CB-CG	5.26	117.86	112.60
1	A	324	GLU	CA-C-N	5.19	131.04	121.70

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	324	GLU	C-N-CA	5.19	131.04	121.70
1	A	306	ASP	CA-CB-CG	5.11	117.71	112.60
1	B	319	GLU	CB-CG-CD	5.11	121.29	112.60
1	B	393	GLY	CA-C-N	5.11	131.29	121.54
1	B	393	GLY	C-N-CA	5.11	131.29	121.54
1	A	392	SER	CA-C-N	5.08	125.62	119.98
1	A	392	SER	C-N-CA	5.08	125.62	119.98
1	A	249	PRO	CA-C-N	5.08	127.59	120.28
1	A	249	PRO	C-N-CA	5.08	127.59	120.28
1	A	203	PHE	CA-CB-CG	5.07	118.87	113.80
1	B	110	ASP	CA-CB-CG	5.00	117.60	112.60

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	3296	0	3176	21	0
1	B	3261	0	3146	22	0
2	A	1	0	0	0	0
3	A	291	0	0	2	0
3	B	207	0	0	1	0
All	All	7056	0	6322	43	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 3.

All (43) 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:165:ASP:CG	1:A:166:HIS:H	1.56	1.09
1:B:165:ASP:CG	1:B:166:HIS:H	1.58	1.02
1:A:56:SER:HB3	1:A:165:ASP:OD1	1.62	0.99
1:B:56:SER:HB3	1:B:165:ASP:OD1	1.63	0.96

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:165:ASP:CG	1:B:166:HIS:N	2.36	0.83
1:A:165:ASP:CG	1:A:166:HIS:N	2.35	0.78
1:A:331:SER:H	1:A:332:PRO:HD3	1.58	0.69
1:B:337:VAL:HG21	1:B:345:HIS:CE1	2.27	0.69
1:B:400:MET:HE1	1:B:437:LYS:O	1.93	0.68
1:B:111:LYS:HD3	1:B:249:PRO:HG2	1.78	0.65
1:A:345:HIS:CD2	3:A:682:HOH:O	2.53	0.62
1:A:167:GLY:HA3	1:A:207:ALA:HB1	1.87	0.56
1:B:277:THR:HA	1:B:307:SER:HA	1.90	0.54
1:A:445:ILE:HG23	1:A:450:ILE:HB	1.90	0.54
1:B:400:MET:O	1:B:440:ARG:HD2	2.09	0.53
1:A:345:HIS:HD2	3:A:682:HOH:O	1.89	0.52
1:B:445:ILE:HG23	1:B:450:ILE:HB	1.91	0.52
1:B:416:CYS:HG	1:B:446:CYS:CB	2.22	0.51
1:B:245:GLU:CB	1:B:246:PRO:HD3	2.42	0.50
1:A:277:THR:HA	1:A:307:SER:HA	1.94	0.48
1:B:398:GLU:O	1:B:402:THR:HB	2.14	0.47
1:B:242:PRO:HB3	1:B:250:ALA:HA	1.97	0.47
1:B:395:LYS:HE3	1:B:395:LYS:HB2	1.81	0.46
1:A:331:SER:N	1:A:332:PRO:HD3	2.27	0.45
1:B:245:GLU:HB3	1:B:246:PRO:HD3	1.98	0.45
1:A:331:SER:N	1:A:332:PRO:CD	2.80	0.45
1:B:167:GLY:HA3	1:B:207:ALA:HB1	1.99	0.45
1:B:276:GLN:HG3	1:B:323:TYR:CD2	2.52	0.45
1:A:342:ALA:O	1:A:345:HIS:HB2	2.17	0.44
1:A:209:GLU:HG3	1:A:232:ALA:HA	2.00	0.44
1:B:278:LEU:HB2	1:B:304:SER:HA	2.00	0.43
1:A:276:GLN:HG3	1:A:323:TYR:CD2	2.54	0.43
1:A:89:MET:O	1:A:123:THR:HA	2.19	0.42
1:A:278:LEU:HB2	1:A:304:SER:HA	2.01	0.42
1:A:64:HIS:CG	1:A:165:ASP:HA	2.55	0.42
1:B:280:GLN:HG2	1:B:326:GLU:HA	2.01	0.41
1:A:331:SER:H	1:A:332:PRO:CD	2.31	0.41
1:B:166:HIS:HA	3:B:634:HOH:O	2.19	0.41
1:B:201:LEU:HB3	1:B:224:ILE:HG12	2.03	0.41
1:A:238:VAL:HG21	1:A:342:ALA:HB2	2.03	0.40
1:B:240:TYR:HB3	1:B:248:VAL:HG21	2.02	0.40
1:A:420:MET:HE3	1:A:445:ILE:HG22	2.03	0.40
1:A:50:ALA:HA	1:A:160:PHE:O	2.22	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	416/532 (78%)	404 (97%)	9 (2%)	3 (1%)	18	15
1	B	411/532 (77%)	395 (96%)	13 (3%)	3 (1%)	18	15
All	All	827/1064 (78%)	799 (97%)	22 (3%)	6 (1%)	18	15

All (6) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	165	ASP
1	B	165	ASP
1	B	245	GLU
1	B	432	SER
1	A	245	GLU
1	A	331	SER

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	355/454 (78%)	344 (97%)	11 (3%)	35	39
1	B	350/454 (77%)	334 (95%)	16 (5%)	24	25
All	All	705/908 (78%)	678 (96%)	27 (4%)	29	32

All (27) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	98	ARG
1	A	108	SER
1	A	209	GLU
1	A	222	LEU
1	A	321	ARG
1	A	331	SER
1	A	333	HIS
1	A	352	GLN
1	A	359	ARG
1	A	360	ASN
1	A	454	LYS
1	B	60	GLN
1	B	108	SER
1	B	177	GLU
1	B	244	GLN
1	B	248	VAL
1	B	321	ARG
1	B	324	GLU
1	B	326	GLU
1	B	350	LYS
1	B	359	ARG
1	B	367	GLN
1	B	395	LYS
1	B	402	THR
1	B	432	SER
1	B	457	GLU
1	B	462	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (8) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	193	HIS
1	A	374	HIS
1	A	377	HIS
1	A	401	ASN
1	B	244	GLN
1	B	281	GLN
1	B	360	ASN
1	B	377	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](#)

Of 1 ligands modelled in this entry, 1 is monoatomic - leaving 0 for Mogul analysis.

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

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	420/532 (78%)	-0.07	17 (4%)	42 44	17, 27, 54, 93	0
1	B	415/532 (78%)	0.65	40 (9%)	13 14	20, 38, 69, 109	0
All	All	835/1064 (78%)	0.29	57 (6%)	23 25	17, 32, 63, 109	0

All (57) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	466	PHE	8.1
1	A	467	PRO	5.5
1	B	464	LEU	5.5
1	B	394	ALA	4.8
1	B	396	ALA	4.3
1	A	331	SER	4.2
1	A	45	ALA	4.2
1	B	244	GLN	3.8
1	A	464	LEU	3.7
1	B	243	SER	3.7
1	A	332	PRO	3.5
1	B	45	ALA	3.5
1	A	246	PRO	3.4
1	B	332	PRO	3.4
1	A	465	ASN	3.4
1	A	245	GLU	3.3
1	B	140	LYS	3.3
1	B	246	PRO	3.2
1	B	247	PRO	3.1
1	B	395	LYS	3.0
1	B	429	GLY	3.0
1	B	141	THR	3.0
1	B	139	ASN	2.9
1	B	326	GLU	2.9

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Mol	Chain	Res	Type	RSRZ
1	A	345	HIS	2.8
1	B	400	MET	2.8
1	B	402	THR	2.8
1	A	329	SER	2.8
1	A	330	SER	2.7
1	A	243	SER	2.7
1	B	432	SER	2.6
1	B	377	HIS	2.6
1	A	333	HIS	2.6
1	A	244	GLN	2.5
1	B	403	ILE	2.5
1	B	325	ASP	2.5
1	B	142	ALA	2.5
1	B	388	LEU	2.4
1	B	426	THR	2.4
1	B	155	PRO	2.3
1	B	270	VAL	2.3
1	B	222	LEU	2.3
1	B	111	LYS	2.2
1	B	221	GLY	2.2
1	B	245	GLU	2.2
1	B	452	LYS	2.2
1	A	325	ASP	2.2
1	B	398	GLU	2.2
1	B	248	VAL	2.1
1	B	399	MET	2.1
1	B	109	PRO	2.1
1	B	333	HIS	2.1
1	B	319	GLU	2.0
1	B	49	TRP	2.0
1	B	458	ALA	2.0
1	B	454	LYS	2.0
1	A	247	PRO	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

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	NA	A	501	1/1	0.80	0.23	51,51,51,51	0

6.5 Other polymers

There are no such residues in this entry.