



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 12, 2026 – 01:29 PM UTC

PDB ID : 2QNA / pdb_00002qna
Title : Crystal structure of human Importin-beta (127-876) in complex with the IBB-domain of Snurportin1 (1-65)
Authors : Wohlwend, D.; Strasser, A.; Dickmanns, A.; Ficner, R.
Deposited on : 2007-07-18
Resolution : 2.84 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

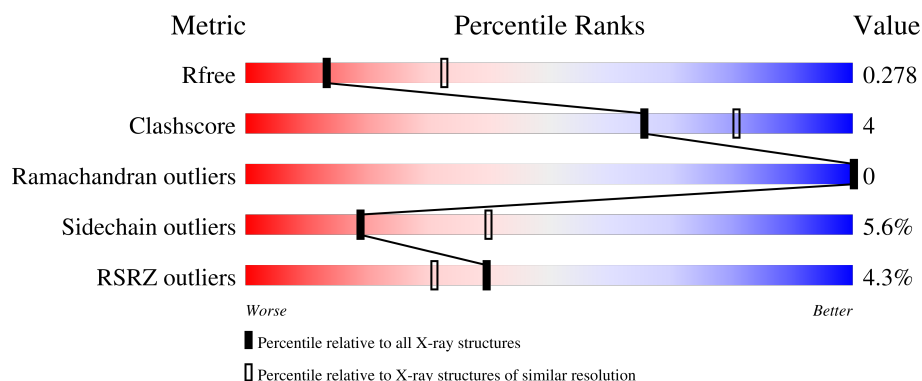
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.84 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	1520 (2.86-2.82)
Clashscore	190562	1559 (2.86-2.82)
Ramachandran outliers	187476	1517 (2.86-2.82)
Sidechain outliers	187428	1518 (2.86-2.82)
RSRZ outliers	180081	1521 (2.86-2.82)

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	762	
2	B	66	

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 6090 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 Importin subunit beta-1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	744	Total	C	N	O	S	0	0	0
			5769	3639	957	1129	44			

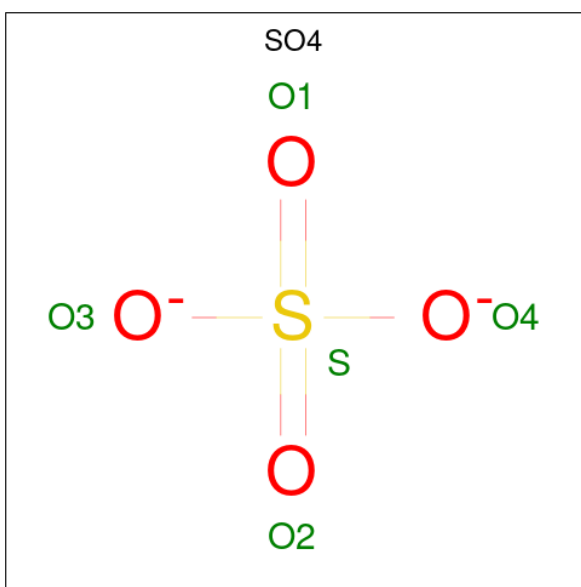
There are 13 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	126	SER	-	cloning artifact	UNP Q14974
A	876	GLY	ALA	cloning artifact	UNP Q14974
A	877	LEU	-	cloning artifact	UNP Q14974
A	878	THR	-	cloning artifact	UNP Q14974
A	879	ARG	-	cloning artifact	UNP Q14974
A	880	VAL	-	cloning artifact	UNP Q14974
A	881	ASP	-	cloning artifact	UNP Q14974
A	882	SER	-	cloning artifact	UNP Q14974
A	883	SER	-	cloning artifact	UNP Q14974
A	884	GLY	-	cloning artifact	UNP Q14974
A	885	ARG	-	cloning artifact	UNP Q14974
A	886	ILE	-	cloning artifact	UNP Q14974
A	887	VAL	-	cloning artifact	UNP Q14974

- Molecule 2 is a protein called Snurportin-1.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
2	B	30	Total	C	N	O	5	0	0
			261	158	58	45			

- Molecule 3 is SULFATE ION (CCD ID: SO4) (formula: O₄S).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	O	S	0	0
			5	4	1		
3	A	1	Total	O	S	0	0
			5	4	1		

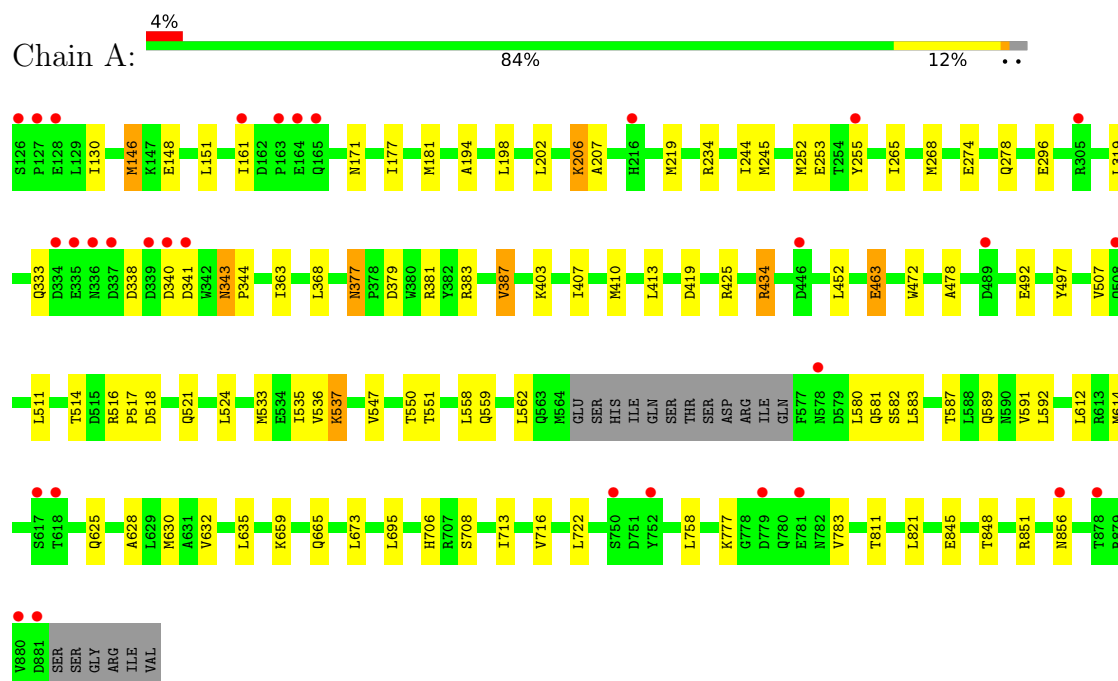
- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	46	Total	O	0	0
			46	46		
4	B	4	Total	O	0	0
			4	4		

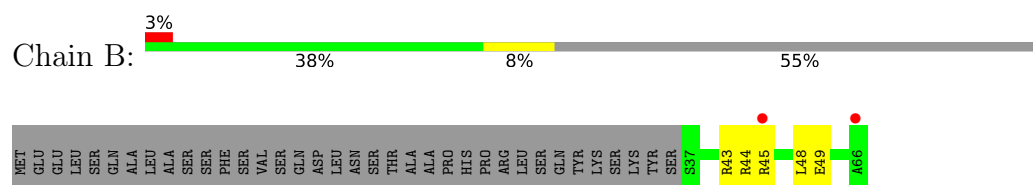
3 Residue-property plots [i](#)

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: Importin subunit beta-1



• Molecule 2: Snurportin-1



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	64.22Å 79.07Å 208.46Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	15.00 – 2.84 15.00 – 2.84	Depositor EDS
% Data completeness (in resolution range)	100.0 (15.00-2.84) 99.1 (15.00-2.84)	Depositor EDS
R_{merge}	0.19	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.59 (at 2.86Å)	Xtriage
Refinement program	REFMAC 5.3.0008	Depositor
R, R_{free}	0.233 , 0.282 0.230 , 0.278	Depositor DCC
R_{free} test set	1304 reflections (5.08%)	wwPDB-VP
Wilson B-factor (Å ²)	32.5	Xtriage
Anisotropy	0.085	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.37 , 42.4	EDS
L-test for twinning ²	$\langle L \rangle = 0.46$, $\langle L^2 \rangle = 0.29$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.89	EDS
Total number of atoms	6090	wwPDB-VP
Average B, all atoms (Å ²)	31.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.51% 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: SO4

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	0.42	1/5863 (0.0%)	0.86	0/7957
2	B	0.42	0/262	0.79	0/346
All	All	0.42	1/6125 (0.0%)	0.86	0/8303

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	130	ILE	CA-CB	5.20	1.57	1.54

There are no bond angle outliers.

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	5769	0	5750	45	0
2	B	261	0	276	3	0
3	A	10	0	0	0	0
4	A	46	0	0	0	0
4	B	4	0	0	0	0
All	All	6090	0	6026	46	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 4.

All (46) 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:537:LYS:HG3	1:A:587:THR:HG22	1.65	0.78
1:A:533:MET:HB3	1:A:587:THR:HG21	1.72	0.70
1:A:478:ALA:HB2	1:A:535:ILE:HD13	1.73	0.69
1:A:265:ILE:HA	1:A:268:MET:HE3	1.75	0.69
1:A:377:ASN:HD22	1:A:379:ASP:H	1.42	0.66
1:A:419:ASP:O	1:A:425:ARG:HD2	1.97	0.64
1:A:245:MET:HA	1:A:245:MET:HE3	1.82	0.61
1:A:219:MET:HE1	1:A:244:ILE:HD13	1.82	0.61
1:A:536:VAL:HG13	1:A:547:VAL:HG13	1.84	0.60
1:A:253:GLU:HG3	1:A:255:TYR:HB3	1.88	0.56
1:A:206:LYS:HD3	1:A:207:ALA:H	1.72	0.55
1:A:630:MET:HE1	2:B:44:ARG:HG2	1.88	0.55
1:A:848:THR:HA	1:A:851:ARG:HH21	1.73	0.53
1:A:551:THR:HG21	1:A:591:VAL:HG11	1.91	0.53
1:A:777:LYS:HG3	1:A:783:VAL:HG13	1.92	0.52
1:A:665:GLN:HE21	1:A:665:GLN:HA	1.75	0.51
1:A:151:LEU:HD13	1:A:194:ALA:HB2	1.93	0.50
1:A:559:GLN:HG3	1:A:614:MET:HG3	1.93	0.49
1:A:383:ARG:O	1:A:387:VAL:HG23	2.12	0.49
1:A:706:HIS:HD2	1:A:708:SER:H	1.61	0.47
1:A:245:MET:HE1	1:A:252:MET:HG3	1.96	0.46
1:A:410:MET:HE1	1:A:452:LEU:HD13	1.97	0.46
1:A:582:SER:HB3	2:B:43:ARG:HD2	1.96	0.46
1:A:518:ASP:O	1:A:521:GLN:HG2	2.16	0.45
1:A:146:MET:HA	1:A:146:MET:HE2	1.98	0.45
1:A:713:ILE:O	1:A:716:VAL:HG12	2.17	0.45
1:A:592:LEU:HD21	1:A:635:LEU:HD12	1.99	0.45
1:A:511:LEU:O	1:A:514:THR:HB	2.16	0.44
1:A:177:ILE:HG22	1:A:181:MET:HE2	1.99	0.44
1:A:659:LYS:HG3	1:A:695:LEU:HD22	2.00	0.44
1:A:181:MET:HE1	1:A:198:LEU:HD22	2.00	0.43
1:A:219:MET:HA	1:A:219:MET:HE2	2.00	0.43
1:A:343:ASN:HB2	1:A:344:PRO:HD2	2.01	0.42
1:A:628:ALA:O	1:A:632:VAL:HG23	2.20	0.42
2:B:45:ARG:O	2:B:49:GLU:HG2	2.19	0.42
1:A:403:LYS:O	1:A:407:ILE:HG12	2.18	0.42
1:A:507:VAL:HG13	1:A:550:THR:HG21	2.00	0.42
1:A:463:GLU:H	1:A:463:GLU:CD	2.29	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:198:LEU:O	1:A:202:LEU:HG	2.21	0.41
1:A:253:GLU:CG	1:A:255:TYR:HB3	2.51	0.41
1:A:319:LEU:HD21	1:A:363:ILE:HA	2.03	0.41
1:A:333:GLN:O	1:A:381:ARG:NH2	2.54	0.41
1:A:434:ARG:HG3	1:A:472:TRP:HH2	1.86	0.41
1:A:562:LEU:HA	1:A:581:GLN:HE21	1.85	0.41
1:A:516:ARG:HA	1:A:517:PRO:HD3	1.84	0.40
1:A:665:GLN:HA	1:A:665:GLN:NE2	2.36	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	740/762 (97%)	722 (98%)	18 (2%)	0	100	100
2	B	28/66 (42%)	27 (96%)	1 (4%)	0	100	100
All	All	768/828 (93%)	749 (98%)	19 (2%)	0	100	100

There are no Ramachandran outliers to report.

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	638/656 (97%)	602 (94%)	36 (6%)	19	40

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
2	B	28/60 (47%)	27 (96%)	1 (4%)	31	56
All	All	666/716 (93%)	629 (94%)	37 (6%)	19	40

All (37) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	146	MET
1	A	148	GLU
1	A	161	ILE
1	A	171	ASN
1	A	206	LYS
1	A	234	ARG
1	A	274	GLU
1	A	278	GLN
1	A	296	GLU
1	A	338	ASP
1	A	340	ASP
1	A	341	ASP
1	A	343	ASN
1	A	368	LEU
1	A	377	ASN
1	A	387	VAL
1	A	413	LEU
1	A	434	ARG
1	A	463	GLU
1	A	492	GLU
1	A	497	TYR
1	A	524	LEU
1	A	537	LYS
1	A	558	LEU
1	A	580	LEU
1	A	583	LEU
1	A	589	GLN
1	A	612	LEU
1	A	625	GLN
1	A	673	LEU
1	A	722	LEU
1	A	758	LEU
1	A	811	THR
1	A	821	LEU
1	A	845	GLU
1	A	856	ASN

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Mol	Chain	Res	Type
2	B	48	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (20) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	139	ASN
1	A	159	GLN
1	A	179	GLN
1	A	239	GLN
1	A	240	ASN
1	A	278	GLN
1	A	285	ASN
1	A	328	GLN
1	A	377	ASN
1	A	401	GLN
1	A	445	ASN
1	A	454	GLN
1	A	521	GLN
1	A	522	ASN
1	A	559	GLN
1	A	578	ASN
1	A	665	GLN
1	A	706	HIS
1	A	744	GLN
1	A	759	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

2 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	SO4	A	1	-	4,4,4	0.24	0	6,6,6	0.06	0
3	SO4	A	2	-	4,4,4	0.23	0	6,6,6	0.11	0

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

There are no such residues in this entry.

5.8 Polymer linkage issues

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	744/762 (97%)	0.04	31 (4%) 40 32	18, 28, 49, 58	0
2	B	30/66 (45%)	0.79	2 (6%) 24 18	18, 31, 41, 41	1 (3%)
All	All	774/828 (93%)	0.07	33 (4%) 40 31	18, 29, 49, 58	1 (0%)

All (33) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	489	ASP	5.4
1	A	127	PRO	4.9
1	A	752	TYR	4.0
1	A	880	VAL	3.9
1	A	881	ASP	3.7
1	A	337	ASP	3.6
1	A	446	ASP	3.6
1	A	340	ASP	3.5
1	A	578	ASN	3.5
1	A	339	ASP	3.5
1	A	336	ASN	3.3
2	B	66	ALA	3.2
1	A	165	GLN	3.2
1	A	255	TYR	3.2
1	A	164	GLU	3.1
1	A	750	SER	3.1
1	A	779	ASP	3.1
1	A	163	PRO	3.1
1	A	618	THR	2.9
1	A	617	SER	2.8
1	A	781	GLU	2.7
1	A	126	SER	2.7
1	A	878	THR	2.6
1	A	856	ASN	2.5

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Mol	Chain	Res	Type	RSRZ
1	A	335	GLU	2.5
1	A	161	ILE	2.4
1	A	216	HIS	2.3
1	A	128	GLU	2.2
1	A	341	ASP	2.1
1	A	508	GLN	2.1
2	B	45	ARG	2.1
1	A	334	ASP	2.1
1	A	305	ARG	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](#)

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
3	SO4	A	2	5/5	0.87	0.10	66,67,67,67	0
3	SO4	A	1	5/5	0.91	0.12	60,61,61,61	0

6.5 Other polymers [i](#)

There are no such residues in this entry.