



Full wwPDB X-ray Structure Validation Report ⓘ

Jun 17, 2024 – 10:09 am BST

PDB ID : 8S0N
Title : Crystal structure of the TMPRSS2 zymogen in complex with the nanobody A07
Authors : Duquerroy, S.; Fernandez, I.; Rey, F.
Deposited on : 2024-02-14
Resolution : 2.30 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 : 4.02b-467
Xtriage (Phenix) : 1.13
EDS : 2.37.1
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac : 5.8.0158
CCP4 : 7.0.044 (Gargrove)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.37.1

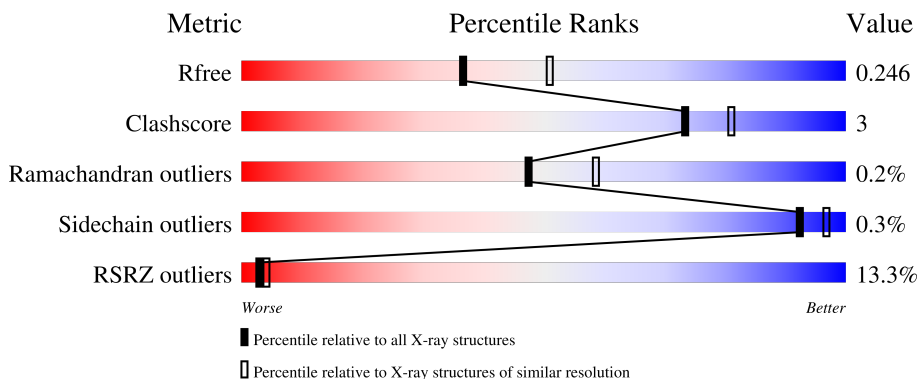
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.30 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}	130704	5042 (2.30-2.30)
Clashscore	141614	5643 (2.30-2.30)
Ramachandran outliers	138981	5575 (2.30-2.30)
Sidechain outliers	138945	5575 (2.30-2.30)
RSRZ outliers	127900	4938 (2.30-2.30)

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	397	
1	C	397	
2	B	150	
2	D	150	

2 Entry composition [i](#)

There are 3 unique types of molecules in this entry. The entry contains 7251 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 Transmembrane protease serine 2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	324	2529	1606	437	463	23	0	0	0
1	C	324	2535	1612	438	462	23	0	1	0

There are 24 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	105	ARG	-	expression tag	UNP O15393
A	106	SER	-	expression tag	UNP O15393
A	441	ALA	SER	engineered mutation	UNP O15393
A	493	GLY	-	expression tag	UNP O15393
A	494	PRO	-	expression tag	UNP O15393
A	495	PHE	-	expression tag	UNP O15393
A	496	GLU	-	expression tag	UNP O15393
A	497	ASP	-	expression tag	UNP O15393
A	498	ASP	-	expression tag	UNP O15393
A	499	ASP	-	expression tag	UNP O15393
A	500	ASP	-	expression tag	UNP O15393
A	501	LYS	-	expression tag	UNP O15393
C	105	ARG	-	expression tag	UNP O15393
C	106	SER	-	expression tag	UNP O15393
C	441	ALA	SER	engineered mutation	UNP O15393
C	493	GLY	-	expression tag	UNP O15393
C	494	PRO	-	expression tag	UNP O15393
C	495	PHE	-	expression tag	UNP O15393
C	496	GLU	-	expression tag	UNP O15393
C	497	ASP	-	expression tag	UNP O15393
C	498	ASP	-	expression tag	UNP O15393
C	499	ASP	-	expression tag	UNP O15393
C	500	ASP	-	expression tag	UNP O15393
C	501	LYS	-	expression tag	UNP O15393

- Molecule 2 is a protein called nanobody A07.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	130	Total	C	N	O	S	0	0	0
			991	612	180	196	3			
2	D	129	Total	C	N	O	S	0	0	0
			987	610	179	195	3			

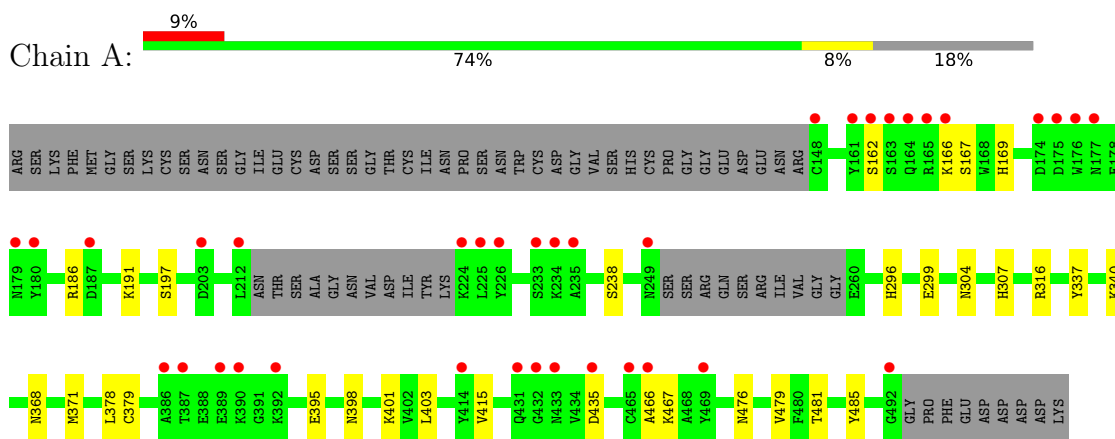
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	87	Total	O	0	0
			87	87		
3	B	57	Total	O	0	0
			57	57		
3	D	19	Total	O	0	0
			19	19		
3	C	46	Total	O	0	0
			46	46		

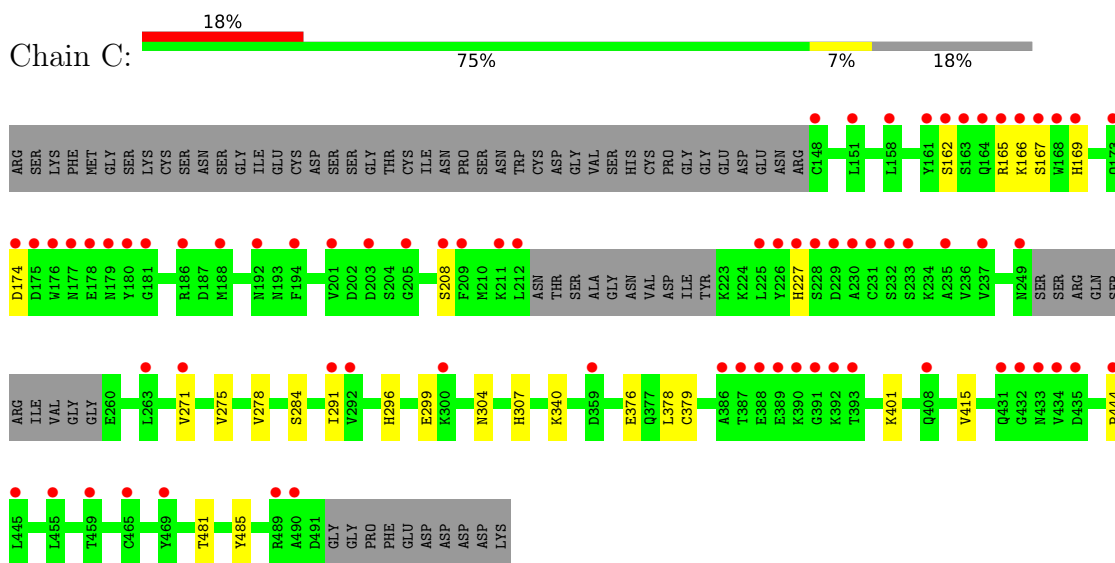
3 Residue-property plots [i](#)

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.

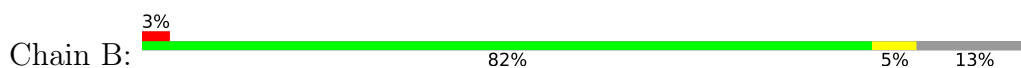
- Molecule 1: Transmembrane protease serine 2

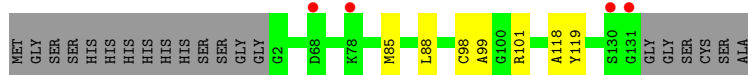


- Molecule 1: Transmembrane protease serine 2

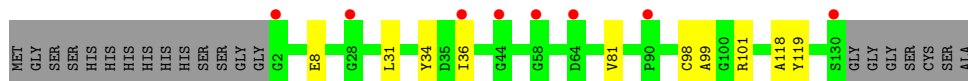
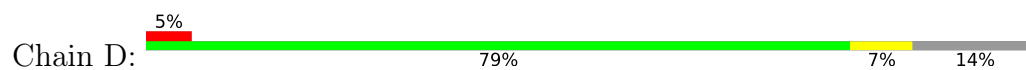


- Molecule 2: nanobody A07





● Molecule 2: nanobody A07



4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	161.87Å 54.46Å 165.82Å 90.00° 108.39° 90.00°	Depositor
Resolution (Å)	24.42 – 2.30 24.42 – 2.30	Depositor EDS
% Data completeness (in resolution range)	82.6 (24.42-2.30) 73.5 (24.42-2.30)	Depositor EDS
R_{merge}	0.24	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	0.72 (at 2.31Å)	Xtrriage
Refinement program	PHENIX 1.21_5207	Depositor
R, R_{free}	0.211 , 0.246 0.210 , 0.246	Depositor DCC
R_{free} test set	2556 reflections (5.02%)	wwPDB-VP
Wilson B-factor (Å ²)	31.3	Xtrriage
Anisotropy	0.363	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.30 , 40.8	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	0.92	EDS
Total number of atoms	7251	wwPDB-VP
Average B, all atoms (Å ²)	63.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.95% 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](#)

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	0.29	0/2598	0.57	0/3534
1	C	0.29	0/2607	0.59	0/3548
2	B	0.29	0/1012	0.59	0/1373
2	D	0.27	0/1008	0.58	0/1368
All	All	0.29	0/7225	0.58	0/9823

There are no bond length outliers.

There are no bond angle outliers.

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	2529	0	2422	22	0
1	C	2535	0	2434	19	0
2	B	991	0	945	5	0
2	D	987	0	942	8	0
3	A	87	0	0	4	0
3	B	57	0	0	1	0
3	C	46	0	0	0	0
3	D	19	0	0	0	0
All	All	7251	0	6743	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 3.

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:C:167:SER:OG	1:C:169:HIS:NE2	2.20	0.73
1:A:304:ASN:HB3	1:A:307:HIS:CD2	2.26	0.70
1:C:304:ASN:HB3	1:C:307:HIS:CD2	2.28	0.68
1:A:296:HIS:HA	1:A:299:GLU:HG3	1.77	0.66
1:C:296:HIS:HA	1:C:299:GLU:HG3	1.77	0.66
1:A:167:SER:OG	1:A:169:HIS:NE2	2.28	0.65
1:A:401:LYS:NZ	1:C:376:GLU:OE1	2.28	0.65
1:A:435:ASP:HA	1:A:466:ALA:HB2	1.80	0.64
2:D:31:LEU:HD13	2:D:81:VAL:HG23	1.84	0.60
1:A:186:ARG:HG2	1:A:191:LYS:O	2.04	0.58
1:A:485:TYR:OH	3:A:601:HOH:O	2.15	0.57
1:C:165:ARG:HG3	1:C:227:HIS:CE1	2.41	0.56
1:A:316:ARG:NH1	3:A:602:HOH:O	2.38	0.56
1:A:162:SER:O	1:A:166:LYS:N	2.41	0.54
1:A:299:GLU:OE2	1:A:337:TYR:OH	2.18	0.53
1:C:162:SER:O	1:C:166:LYS:N	2.42	0.53
2:D:118:ALA:C	1:C:340:LYS:HE3	2.31	0.51
2:D:8:GLU:N	2:D:8:GLU:OE1	2.44	0.51
1:A:403:LEU:HD13	1:C:378:LEU:HD22	1.91	0.50
1:C:275:VAL:O	1:C:278:VAL:HG22	2.12	0.49
1:C:271:VAL:HG21	1:C:291:ILE:HD13	1.94	0.49
2:D:99:ALA:HA	2:D:119:TYR:O	2.14	0.48
1:C:284:SER:OG	1:C:444:PRO:HB3	2.14	0.47
1:A:395:GLU:OE2	3:A:602:HOH:O	2.21	0.47
1:A:378:LEU:HD12	1:A:379:CYS:N	2.30	0.46
2:B:85:MET:HB3	2:B:88:LEU:HD21	1.98	0.45
1:A:398:ASN:HB2	3:A:635:HOH:O	2.16	0.45
2:D:119:TYR:CE1	1:C:340:LYS:HE2	2.51	0.44
1:C:378:LEU:HD12	1:C:379:CYS:N	2.33	0.44
2:D:36:ILE:HG13	2:D:81:VAL:HG21	2.00	0.44
1:A:368:ASN:O	1:A:371:MET:HG2	2.18	0.44
1:A:476:ASN:O	1:A:479:VAL:HG22	2.18	0.44
1:A:340:LYS:HE3	2:B:118:ALA:C	2.38	0.44
1:A:340:LYS:HE2	2:B:119:TYR:CE1	2.54	0.43
1:A:378:LEU:HD23	1:C:376:GLU:HB2	2.00	0.43
2:B:99:ALA:HA	2:B:119:TYR:O	2.19	0.42
1:A:467:LYS:HD3	1:A:467:LYS:HA	1.82	0.42
2:D:119:TYR:CD1	1:C:340:LYS:HE2	2.54	0.42
1:C:481:THR:HG22	1:C:485:TYR:CE2	2.54	0.42
1:A:481:THR:HG22	1:A:485:TYR:CE2	2.55	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:197:SER:HA	1:A:238:SER:O	2.20	0.41
2:D:34:TYR:HA	2:D:101:ARG:O	2.21	0.41
1:C:174:ASP:N	1:C:174:ASP:OD1	2.53	0.40
1:C:169:HIS:ND1	1:C:208:SER:O	2.54	0.40
2:B:101:ARG:HD2	3:B:239:HOH:O	2.22	0.40
1:C:378:LEU:HD21	1:C:401:LYS:HE2	2.03	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	318/397 (80%)	307 (96%)	10 (3%)	1 (0%)	41	50
1	C	319/397 (80%)	309 (97%)	9 (3%)	1 (0%)	41	50
2	B	128/150 (85%)	124 (97%)	4 (3%)	0	100	100
2	D	127/150 (85%)	123 (97%)	4 (3%)	0	100	100
All	All	892/1094 (82%)	863 (97%)	27 (3%)	2 (0%)	47	58

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	415	VAL
1	C	415	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	273/337 (81%)	273 (100%)	0	100	100
1	C	274/337 (81%)	274 (100%)	0	100	100
2	B	106/120 (88%)	105 (99%)	1 (1%)	78	89
2	D	106/120 (88%)	105 (99%)	1 (1%)	78	89
All	All	759/914 (83%)	757 (100%)	2 (0%)	92	97

All (2) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	B	98	CYS
2	D	98	CYS

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

Mol	Chain	Res	Type
1	A	307	HIS
1	C	307	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 monosaccharides 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 [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	324/397 (81%)	0.64	37 (11%) 5 7	26, 48, 115, 157	0
1	C	324/397 (81%)	1.16	72 (22%) 0 1	42, 63, 138, 176	0
2	B	130/150 (86%)	0.18	4 (3%) 49 56	32, 46, 72, 109	0
2	D	129/150 (86%)	0.60	8 (6%) 20 26	48, 64, 91, 111	0
All	All	907/1094 (82%)	0.75	121 (13%) 3 4	26, 57, 123, 176	0

All (121) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	164	GLN	10.4
1	A	175	ASP	9.4
1	C	387	THR	8.6
1	C	163	SER	7.5
1	C	235	ALA	7.4
1	A	432	GLY	6.5
1	C	390	LYS	6.5
1	A	390	LYS	6.4
1	C	175	ASP	6.4
1	C	212	LEU	6.3
1	C	162	SER	6.3
1	C	166	LYS	6.2
1	C	226	TYR	6.0
1	A	212	LEU	5.9
1	C	433	ASN	5.8
1	C	165	ARG	5.7
1	C	161	TYR	5.7
1	A	389	GLU	5.3
1	A	164	GLN	5.3
1	A	162	SER	5.2
1	C	432	GLY	5.2

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Mol	Chain	Res	Type	RSRZ
1	A	387	THR	5.0
1	A	431	GLN	5.0
1	C	167	SER	4.9
1	C	228	SER	4.7
1	C	227	HIS	4.5
1	C	209	PHE	4.5
1	A	225	LEU	4.4
1	C	392	LYS	4.4
2	B	131	GLY	4.3
1	C	391	GLY	4.3
1	A	234	LYS	4.1
1	C	201	VAL	4.1
1	A	392	LYS	4.1
1	C	233	SER	4.1
1	C	386	ALA	4.0
1	C	181	GLY	4.0
1	A	166	LYS	3.9
1	C	230	ALA	3.9
1	A	433	ASN	3.8
1	C	389	GLU	3.8
1	C	232	SER	3.8
1	A	176	TRP	3.8
1	C	173	GLN	3.8
1	A	180	TYR	3.7
1	A	179	ASN	3.7
2	D	130	SER	3.7
1	C	231	CYS	3.6
1	C	177	ASN	3.6
1	C	158	LEU	3.6
1	C	148	CYS	3.5
2	D	44	GLY	3.5
1	A	161	TYR	3.5
1	A	163	SER	3.5
1	C	435	ASP	3.4
1	C	188	MET	3.4
1	A	386	ALA	3.3
1	C	205	GLY	3.3
1	C	388	GLU	3.3
1	C	176	TRP	3.3
2	B	130	SER	3.3
1	C	237	VAL	3.2
1	C	211	LYS	3.1

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Mol	Chain	Res	Type	RSRZ
1	C	192	ASN	3.1
1	C	225	LEU	3.1
1	C	180	TYR	3.0
1	C	174	ASP	3.0
1	C	408	GLN	3.0
1	A	249	ASN	2.9
1	C	186	ARG	2.9
1	C	203	ASP	2.8
1	A	165	ARG	2.8
1	C	208	SER	2.8
1	A	435	ASP	2.8
1	C	393	THR	2.8
1	C	291	ILE	2.7
1	C	431	GLN	2.7
1	A	233	SER	2.7
1	C	489	ARG	2.7
1	C	490	ALA	2.7
1	A	492	GLY	2.7
1	C	168	TRP	2.6
1	A	148	CYS	2.6
1	A	465	CYS	2.6
1	C	179	ASN	2.5
1	A	469	TYR	2.5
2	D	64	ASP	2.5
1	A	177	ASN	2.5
1	C	229	ASP	2.4
1	C	292	VAL	2.4
1	C	465	CYS	2.4
1	A	466	ALA	2.4
1	C	271	VAL	2.4
2	B	68	ASP	2.3
1	C	249	ASN	2.3
1	C	194	PHE	2.3
1	A	235	ALA	2.3
1	C	445	LEU	2.2
1	C	469	TYR	2.2
2	D	58	GLY	2.2
1	C	455	LEU	2.2
2	D	36	ILE	2.2
1	C	151	LEU	2.2
1	A	224	LYS	2.2
2	D	28	GLY	2.2

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Mol	Chain	Res	Type	RSRZ
1	A	414	TYR	2.2
1	C	169	HIS	2.2
1	C	444	PRO	2.2
1	C	263	LEU	2.1
1	C	434	VAL	2.1
1	C	359	ASP	2.1
2	D	90	PRO	2.1
1	A	203	ASP	2.1
1	A	174	ASP	2.1
1	C	178	GLU	2.1
1	A	226	TYR	2.1
1	A	187	ASP	2.0
1	C	300	LYS	2.0
2	B	78	LYS	2.0
1	C	459	THR	2.0
2	D	2	GLY	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 monosaccharides 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.