



Full wwPDB X-ray Structure Validation Report ⓘ

May 7, 2026 – 10:07 AM EDT

PDB ID : 1ZBT / pdb_00001zbt
Title : Crystal structure of Peptide chain release factor 1 (RF-1) (SMU.1085) from Streptococcus mutans at 2.34 Å resolution
Authors : Joint Center for Structural Genomics (JCSG)
Deposited on : 2005-04-08
Resolution : 2.34 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

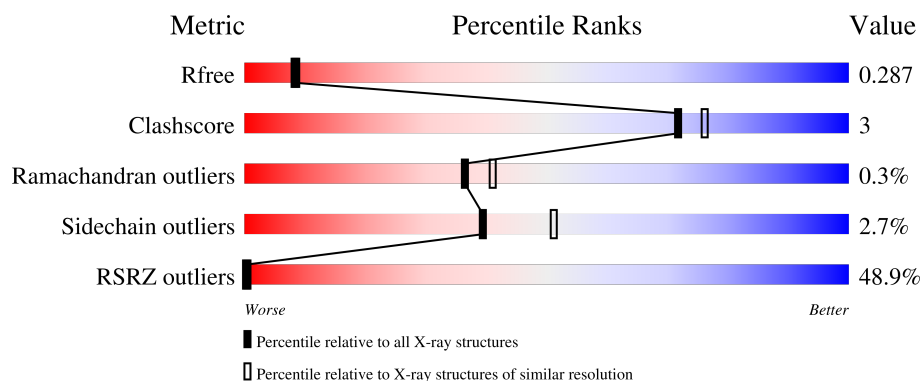
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.34 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	3031 (2.36-2.32)
Clashscore	190562	3127 (2.36-2.32)
Ramachandran outliers	187476	3095 (2.36-2.32)
Sidechain outliers	187428	3095 (2.36-2.32)
RSRZ outliers	180081	3033 (2.36-2.32)

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	371	41% 76% 10% 14%

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 2547 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 chain release factor 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	320	Total	C	N	O	Se	0	0	0
			2486	1553	434	491	8			

There are 22 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-11	MET	-	expression tag	UNP Q8DU64
A	-10	GLY	-	expression tag	UNP Q8DU64
A	-9	SER	-	expression tag	UNP Q8DU64
A	-8	ASP	-	expression tag	UNP Q8DU64
A	-7	LYS	-	expression tag	UNP Q8DU64
A	-6	ILE	-	expression tag	UNP Q8DU64
A	-5	HIS	-	expression tag	UNP Q8DU64
A	-4	HIS	-	expression tag	UNP Q8DU64
A	-3	HIS	-	expression tag	UNP Q8DU64
A	-2	HIS	-	expression tag	UNP Q8DU64
A	-1	HIS	-	expression tag	UNP Q8DU64
A	0	HIS	-	expression tag	UNP Q8DU64
A	1	MSE	MET	modified residue	UNP Q8DU64
A	34	MSE	MET	modified residue	UNP Q8DU64
A	66	MSE	MET	modified residue	UNP Q8DU64
A	79	MSE	MET	modified residue	UNP Q8DU64
A	136	MSE	MET	modified residue	UNP Q8DU64
A	151	MSE	MET	modified residue	UNP Q8DU64
A	167	MSE	MET	modified residue	UNP Q8DU64
A	208	MSE	MET	modified residue	UNP Q8DU64
A	258	MSE	MET	modified residue	UNP Q8DU64
A	272	MSE	MET	modified residue	UNP Q8DU64

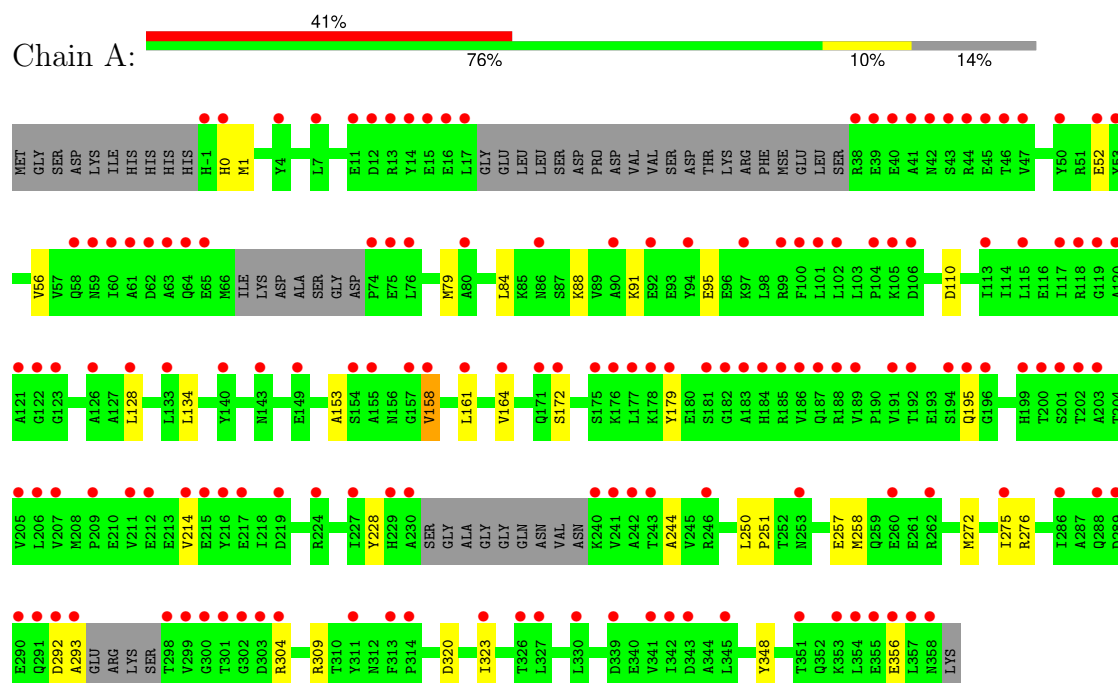
- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	61	Total	O	0	0
			61	61		

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 chain release factor 1



4 Data and refinement statistics

Property	Value	Source
Space group	P 43 21 2	Depositor
Cell constants a, b, c, α , β , γ	69.44Å 69.44Å 188.16Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	28.58 – 2.34 28.58 – 2.34	Depositor EDS
% Data completeness (in resolution range)	99.3 (28.58-2.34) 99.3 (28.58-2.34)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.09	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.97 (at 2.34Å)	Xtriage
Refinement program	REFMAC 5.2.0005	Depositor
R, R_{free}	0.221 , 0.275 0.242 , 0.287	Depositor DCC
R_{free} test set	1033 reflections (5.09%)	wwPDB-VP
Wilson B-factor (Å ²)	38.5	Xtriage
Anisotropy	0.540	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.36 , 50.5	EDS
L-test for twinning ²	$\langle L \rangle = 0.47$, $\langle L^2 \rangle = 0.30$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.88	EDS
Total number of atoms	2547	wwPDB-VP
Average B, all atoms (Å ²)	55.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.65% 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	0.76	1/2507 (0.0%)	0.83	0/3371

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	195	GLN	CD-NE2	6.59	1.47	1.33

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	2486	0	2408	16	0
2	A	61	0	0	2	0
All	All	2547	0	2408	16	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 (16) 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:110:ASP:HA	1:A:172:SER:HA	1.91	0.52

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:276:ARG:HD3	2:A:376:HOH:O	2.10	0.50
1:A:292:ASP:O	1:A:293:ALA:HB3	2.10	0.50
1:A:153:ALA:HB2	1:A:164:VAL:HG23	1.94	0.48
1:A:272:MSE:SE	1:A:275:ILE:HD11	2.64	0.47
1:A:309:ARG:HG3	1:A:320:ASP:HA	1.97	0.46
1:A:91:LYS:O	1:A:95:GLU:HG2	2.17	0.44
1:A:52:GLU:O	1:A:56:VAL:HG23	2.18	0.43
1:A:158:VAL:O	1:A:158:VAL:HG13	2.18	0.42
1:A:323:ILE:HG22	1:A:348:TYR:CG	2.55	0.42
1:A:250:LEU:N	1:A:251:PRO:CD	2.84	0.41
1:A:134:LEU:HD22	1:A:161:LEU:HD21	2.02	0.41
1:A:84:LEU:HD11	1:A:88:LYS:HE3	2.02	0.41
1:A:179:TYR:HB2	2:A:367:HOH:O	2.21	0.40
1:A:257:GLU:O	1:A:258:MSE:HE2	2.21	0.40
1:A:228:TYR:O	1:A:244:ALA:HB3	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	310/371 (84%)	302 (97%)	7 (2%)	1 (0%)	36 41

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	158	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	256/310 (83%)	249 (97%)	7 (3%)	39 51

All (7) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	0	HIS
1	A	1	MSE
1	A	79	MSE
1	A	128	LEU
1	A	214	VAL
1	A	304	ARG
1	A	356	GLU

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	144	GLN
1	A	265	GLN

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

There are no ligands in this entry.

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	311/371 (83%)	2.10	152 (48%) 0 0	36, 54, 71, 93	0

All (152) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	39	GLU	6.5
1	A	300	GLY	5.9
1	A	17	LEU	5.6
1	A	301	THR	5.4
1	A	299	VAL	5.4
1	A	62	ASP	5.1
1	A	61	ALA	5.1
1	A	43	SER	5.0
1	A	14	TYR	4.9
1	A	298	THR	4.9
1	A	63	ALA	4.6
1	A	-1	HIS	4.6
1	A	42	ASN	4.5
1	A	358	ASN	4.4
1	A	15	GLU	4.4
1	A	41	ALA	4.3
1	A	293	ALA	4.3
1	A	0	HIS	4.2
1	A	179	TYR	4.2
1	A	241	VAL	4.0
1	A	59	ASN	4.0
1	A	182	GLY	3.9
1	A	53	TYR	3.7
1	A	65	GLU	3.7
1	A	40	GLU	3.7
1	A	155	ALA	3.7
1	A	242	ALA	3.7

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Mol	Chain	Res	Type	RSRZ
1	A	122	GLY	3.6
1	A	292	ASP	3.5
1	A	357	LEU	3.5
1	A	16	GLU	3.5
1	A	74	PRO	3.5
1	A	356	GLU	3.5
1	A	100	PHE	3.3
1	A	80	ALA	3.2
1	A	314	PRO	3.2
1	A	291	GLN	3.2
1	A	90	ALA	3.2
1	A	302	GLY	3.2
1	A	177	LEU	3.2
1	A	64	GLN	3.2
1	A	304	ARG	3.2
1	A	121	ALA	3.1
1	A	203	ALA	3.1
1	A	240	LYS	3.1
1	A	45	GLU	3.0
1	A	176	LYS	3.0
1	A	115	LEU	3.0
1	A	128	LEU	3.0
1	A	354	LEU	3.0
1	A	192	THR	3.0
1	A	75	GLU	3.0
1	A	191	VAL	2.9
1	A	183	ALA	2.9
1	A	50	TYR	2.9
1	A	186	VAL	2.9
1	A	211	VAL	2.9
1	A	126	ALA	2.8
1	A	219	ASP	2.8
1	A	44	ARG	2.8
1	A	355	GLU	2.8
1	A	178	LYS	2.8
1	A	229	HIS	2.8
1	A	104	PRO	2.8
1	A	202	THR	2.7
1	A	120	ALA	2.7
1	A	341	VAL	2.7
1	A	113	ILE	2.7
1	A	4	TYR	2.7

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Mol	Chain	Res	Type	RSRZ
1	A	290	GLU	2.7
1	A	326	THR	2.7
1	A	118	ARG	2.7
1	A	99	ARG	2.6
1	A	154	SER	2.6
1	A	117	ILE	2.6
1	A	327	LEU	2.6
1	A	217	GLU	2.6
1	A	119	GLY	2.6
1	A	243	THR	2.6
1	A	184	HIS	2.6
1	A	262	ARG	2.6
1	A	157	GLY	2.6
1	A	149	GLU	2.5
1	A	253	ASN	2.5
1	A	339	ASP	2.5
1	A	47	VAL	2.5
1	A	181	SER	2.5
1	A	286	ILE	2.5
1	A	187	GLN	2.5
1	A	52	GLU	2.5
1	A	76	LEU	2.5
1	A	199	HIS	2.5
1	A	175	SER	2.5
1	A	194	SER	2.5
1	A	7	LEU	2.5
1	A	60	ILE	2.4
1	A	143	ASN	2.4
1	A	209	PRO	2.4
1	A	105	LYS	2.4
1	A	123	GLY	2.4
1	A	214	VAL	2.4
1	A	206	LEU	2.4
1	A	106	ASP	2.4
1	A	230	ALA	2.4
1	A	185	ARG	2.4
1	A	246	ARG	2.4
1	A	133	LEU	2.3
1	A	288	GLN	2.3
1	A	330	LEU	2.3
1	A	216	TYR	2.3
1	A	13	ARG	2.3

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Mol	Chain	Res	Type	RSRZ
1	A	205	VAL	2.3
1	A	345	LEU	2.3
1	A	342	ILE	2.3
1	A	201	SER	2.3
1	A	260	GLU	2.3
1	A	227	ILE	2.3
1	A	102	LEU	2.2
1	A	161	LEU	2.2
1	A	164	VAL	2.3
1	A	207	VAL	2.3
1	A	58	GLN	2.2
1	A	171	GLN	2.2
1	A	140	TYR	2.2
1	A	101	LEU	2.2
1	A	200	THR	2.2
1	A	12	ASP	2.1
1	A	303	ASP	2.1
1	A	11	GLU	2.1
1	A	215	GLU	2.1
1	A	92	GLU	2.1
1	A	158	VAL	2.1
1	A	189	VAL	2.1
1	A	46	THR	2.1
1	A	351	THR	2.1
1	A	353	LYS	2.1
1	A	343	ASP	2.1
1	A	196	GLY	2.1
1	A	188	ARG	2.1
1	A	212	GLU	2.1
1	A	195	GLN	2.1
1	A	275	ILE	2.1
1	A	289	ASP	2.1
1	A	94	TYR	2.1
1	A	38	ARG	2.1
1	A	224	ARG	2.1
1	A	311	TYR	2.0
1	A	313	PHE	2.0
1	A	172	SER	2.0
1	A	86	ASN	2.0
1	A	323	ILE	2.0
1	A	97	LYS	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.