



# Full wwPDB X-ray Structure Validation Report ⓘ

Feb 1, 2016 – 04:51 AM GMT

PDB ID : 2OHE  
Title : Structural and mutational analysis of tRNA-Intron splicing endonuclease from  
Thermoplasma acidophilum DSM 1728  
Authors : Kim, Y.K.; Mizutani, K.; Rhee, K.H.; Lee, W.H.; Park, S.Y.; Hwang, K.Y.  
Deposited on : 2007-01-10  
Resolution : 2.70 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](mailto:validation@mail.wwpdb.org)  
A user guide is available at  
<http://wwpdb.org/validation/2016/XrayValidationReportHelp>  
with specific help available everywhere you see the ⓘ symbol.

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The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4.02b-467  
Mogul : 1.7 (RC4), CSD as536be (2015)  
Xtriage (Phenix) : **NOT EXECUTED**  
EDS : **NOT EXECUTED**  
Percentile statistics : 20151230.v01 (using entries in the PDB archive December 30th 2015)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : trunk26865

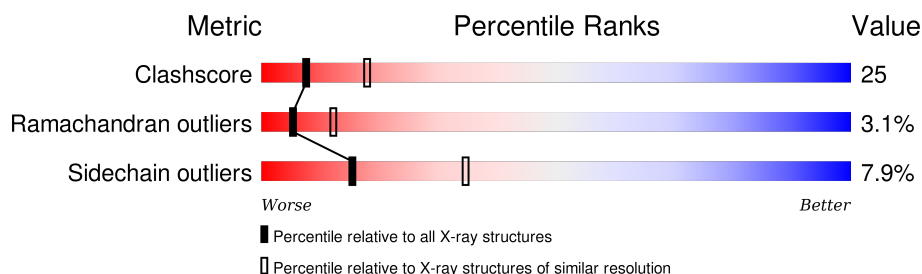
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.70 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))
Clashscore	102246	2422 (2.70-2.70)
Ramachandran outliers	100387	2382 (2.70-2.70)
Sidechain outliers	100360	2382 (2.70-2.70)

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 on the lower bar indicate the fraction of residues that contain outliers for  $\geq 3$ , 2, 1 and 0 types of geometric quality criteria. 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.

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	290	<div> <div></div> <div>55%</div> <div>39%</div> <div>7%</div> </div>

## 2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 2472 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 tRNA-splicing endonuclease.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	290	Total	C	N	O	S	0	0	0
			2356	1510	399	438	9			

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	0	HIS	-	EXPRESSION TAG	UNP Q9HIY5
A	146	GLY	ALA	CONFLICT	UNP Q9HIY5

- Molecule 2 is water.

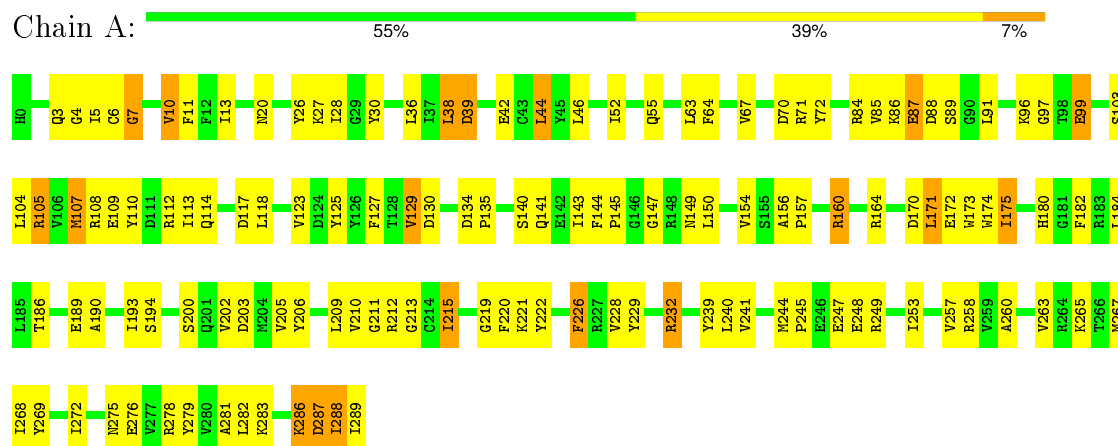
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	116	Total	O	0	0
			116	116		

### 3 Residue-property plots

These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of errors 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.

Note EDS was not executed.

- Molecule 1: tRNA-splicing endonuclease



## 4 Data and refinement statistics

Xtriage (Phenix) and EDS were not executed - this section will therefore be incomplete.

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	164.91Å 46.09Å 58.00Å 90.00° 92.61° 90.00°	Depositor
Resolution (Å)	17.79 – 2.70	Depositor
% Data completeness (in resolution range)	81.8 (17.79-2.70)	Depositor
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	0.07	Depositor
Refinement program	CNS 1.1	Depositor
R, $R_{free}$	0.214 , 0.278	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	2472	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	44.0	wwPDB-VP

## 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	0.42	0/2413	0.62	0/3255

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	1

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	72	TYR	Sidechain

### 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	2356	0	2297	118	0
2	A	116	0	0	7	0
All	All	2472	0	2297	118	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 25.

All (118) 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:228:VAL:HG22	1:A:239:TYR:HB2	1.51	0.89
1:A:215:ILE:HG23	1:A:229:TYR:HB2	1.60	0.83
1:A:141:GLN:HB2	2:A:341:HOH:O	1.78	0.82
1:A:200:SER:HB3	1:A:203:ASP:OD1	1.79	0.82
1:A:10:VAL:HG22	1:A:55:GLN:HB2	1.59	0.81
1:A:172:GLU:HB2	1:A:175:ILE:HG22	1.63	0.80
1:A:71:ARG:HD2	2:A:336:HOH:O	1.83	0.78
1:A:3:GLN:HB2	1:A:11:PHE:O	1.89	0.72
1:A:215:ILE:CG2	1:A:229:TYR:HB2	2.20	0.71
1:A:4:GLY:HA2	1:A:36:LEU:H	1.56	0.70
1:A:113:ILE:HG21	1:A:253:ILE:HD13	1.72	0.70
1:A:99:GLU:CD	1:A:99:GLU:H	1.94	0.69
1:A:206:TYR:O	1:A:210:VAL:HG23	1.92	0.68
1:A:110:TYR:HB2	2:A:378:HOH:O	1.94	0.66
1:A:143:ILE:HD11	1:A:239:TYR:OH	1.95	0.66
1:A:286:LYS:HG3	1:A:287:ASP:N	2.11	0.66
1:A:220:PHE:HB3	2:A:383:HOH:O	1.96	0.65
1:A:288:ILE:O	1:A:289:ILE:HB	1.98	0.64
1:A:172:GLU:HB2	1:A:175:ILE:CG2	2.28	0.64
1:A:219:GLY:N	1:A:226:PHE:HA	2.13	0.64
1:A:171:LEU:O	1:A:172:GLU:C	2.38	0.62
1:A:70:ASP:HB2	1:A:108:ARG:HH21	1.65	0.61
1:A:105:ARG:HE	1:A:107:MET:CE	2.14	0.60
1:A:202:VAL:HG13	2:A:316:HOH:O	1.99	0.60
1:A:220:PHE:C	1:A:222:TYR:H	2.05	0.60
1:A:269:TYR:HD2	1:A:282:LEU:HD13	1.66	0.60
1:A:228:VAL:CG2	1:A:239:TYR:HB2	2.28	0.60
1:A:85:VAL:HG12	1:A:86:LYS:N	2.17	0.59
1:A:114:GLN:HB3	1:A:117:ASP:OD2	2.03	0.59
1:A:145:PRO:HG2	1:A:212:ARG:HD3	1.86	0.58
1:A:104:LEU:HD21	1:A:127:PHE:HB2	1.85	0.58
1:A:147:GLY:HA3	1:A:213:GLY:C	2.24	0.57
1:A:70:ASP:HA	1:A:129:VAL:HG11	1.87	0.56
1:A:39:ASP:OD2	1:A:39:ASP:C	2.43	0.56
1:A:13:ILE:HA	1:A:52:ILE:HG22	1.86	0.56
1:A:87:GLU:CD	1:A:87:GLU:H	2.09	0.56
1:A:172:GLU:CB	1:A:175:ILE:HG22	2.35	0.56
1:A:11:PHE:CZ	1:A:38:LEU:HD22	2.42	0.54

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:232:ARG:HG3	1:A:232:ARG:HH11	1.72	0.54
1:A:263:VAL:O	1:A:263:VAL:HG12	2.06	0.54
1:A:160:ARG:HD3	1:A:164:ARG:O	2.07	0.54
1:A:149:ASN:HB2	1:A:213:GLY:O	2.08	0.53
1:A:4:GLY:C	1:A:5:ILE:HG13	2.30	0.52
1:A:26:TYR:O	1:A:28:ILE:HG23	2.10	0.52
1:A:174:TRP:CE3	1:A:215:ILE:HG13	2.45	0.52
1:A:232:ARG:NH1	1:A:232:ARG:HG3	2.25	0.52
1:A:143:ILE:HG23	1:A:279:TYR:HB2	1.92	0.51
1:A:219:GLY:H	1:A:226:PHE:HA	1.74	0.51
1:A:20:ASN:ND2	2:A:325:HOH:O	2.36	0.51
1:A:222:TYR:CE2	1:A:263:VAL:HG21	2.45	0.51
1:A:27:LYS:HG3	1:A:84:ARG:NH2	2.26	0.51
1:A:64:PHE:O	1:A:67:VAL:O	2.28	0.50
1:A:143:ILE:CG2	1:A:279:TYR:HB2	2.41	0.50
1:A:286:LYS:CG	1:A:287:ASP:N	2.75	0.50
1:A:96:LYS:HB3	1:A:99:GLU:OE1	2.12	0.49
1:A:113:ILE:HG23	1:A:248:GLU:HB3	1.95	0.48
1:A:39:ASP:OD2	1:A:42:GLU:HG3	2.12	0.48
1:A:113:ILE:HD11	1:A:118:LEU:HD21	1.94	0.48
1:A:240:LEU:HA	1:A:240:LEU:HD12	1.70	0.48
1:A:28:ILE:HD12	1:A:42:GLU:HB3	1.96	0.48
1:A:113:ILE:HD12	1:A:114:GLN:H	1.78	0.47
1:A:104:LEU:HD11	1:A:127:PHE:CB	2.44	0.47
1:A:103:SER:OG	1:A:123:VAL:HA	2.13	0.47
1:A:88:ASP:O	1:A:89:SER:HB3	2.15	0.47
1:A:30:TYR:O	1:A:36:LEU:HD12	2.15	0.47
1:A:263:VAL:CG1	1:A:265:LYS:HE2	2.45	0.47
1:A:87:GLU:O	1:A:88:ASP:HB2	2.15	0.47
1:A:140:SER:HA	1:A:281:ALA:O	2.14	0.47
1:A:125:TYR:CE2	1:A:288:ILE:HG13	2.50	0.47
1:A:190:ALA:O	1:A:194:SER:CB	2.63	0.47
1:A:172:GLU:O	1:A:175:ILE:HG22	2.14	0.46
1:A:104:LEU:CD2	1:A:127:PHE:HB2	2.45	0.46
1:A:143:ILE:HG12	1:A:144:PHE:N	2.30	0.46
1:A:38:LEU:HD21	1:A:46:LEU:HD12	1.97	0.46
1:A:186:THR:OG1	1:A:189:GLU:HG3	2.16	0.46
1:A:113:ILE:HG21	1:A:253:ILE:CD1	2.42	0.45
1:A:113:ILE:O	1:A:248:GLU:HB3	2.17	0.45
1:A:104:LEU:HD11	1:A:127:PHE:HB2	1.99	0.45
1:A:220:PHE:C	1:A:222:TYR:N	2.69	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:209:LEU:HD12	1:A:209:LEU:HA	1.84	0.44
1:A:6:CYS:O	1:A:7:GLY:O	2.34	0.44
1:A:272:ILE:HA	1:A:276:GLU:O	2.18	0.44
1:A:164:ARG:NH1	1:A:184:LEU:HD21	2.33	0.44
1:A:156:ALA:HB1	1:A:157:PRO:CD	2.48	0.43
1:A:150:LEU:H	1:A:150:LEU:HD12	1.84	0.43
1:A:154:VAL:CG2	1:A:193:ILE:HG22	2.48	0.43
1:A:172:GLU:O	1:A:173:TRP:C	2.56	0.43
1:A:110:TYR:O	1:A:249:ARG:NH1	2.51	0.43
1:A:258:ARG:C	1:A:260:ALA:H	2.21	0.43
1:A:241:VAL:HG22	1:A:268:ILE:HB	1.99	0.43
1:A:205:VAL:O	1:A:209:LEU:HB2	2.18	0.43
1:A:87:GLU:CD	1:A:87:GLU:N	2.73	0.43
1:A:253:ILE:O	1:A:257:VAL:HG23	2.19	0.43
1:A:286:LYS:O	1:A:287:ASP:C	2.57	0.43
1:A:286:LYS:HG3	1:A:287:ASP:H	1.84	0.42
1:A:202:VAL:O	1:A:205:VAL:HG12	2.19	0.42
1:A:244:MET:HA	1:A:245:PRO:HD2	1.89	0.42
1:A:211:GLY:HA3	2:A:400:HOH:O	2.19	0.42
1:A:222:TYR:HB3	1:A:240:LEU:HD21	2.02	0.42
1:A:85:VAL:CG1	1:A:86:LYS:N	2.82	0.42
1:A:134:ASP:OD1	1:A:135:PRO:HD2	2.20	0.42
1:A:287:ASP:O	1:A:289:ILE:N	2.53	0.41
1:A:44:LEU:HD21	1:A:64:PHE:HA	2.02	0.41
1:A:91:LEU:HD21	1:A:123:VAL:HG11	2.03	0.41
1:A:258:ARG:C	1:A:260:ALA:N	2.72	0.41
1:A:4:GLY:HA3	1:A:36:LEU:HB3	2.02	0.41
1:A:180:HIS:O	1:A:182:PHE:HD1	2.04	0.41
1:A:263:VAL:HG11	1:A:265:LYS:HE2	2.02	0.41
1:A:91:LEU:HD21	1:A:123:VAL:CG1	2.51	0.41
1:A:6:CYS:O	1:A:7:GLY:C	2.59	0.41
1:A:170:ASP:O	1:A:171:LEU:C	2.59	0.41
1:A:38:LEU:HA	1:A:38:LEU:HD12	1.91	0.41
1:A:130:ASP:OD1	1:A:134:ASP:HB3	2.21	0.41
1:A:202:VAL:HA	1:A:205:VAL:HG12	2.03	0.40
1:A:156:ALA:HB3	1:A:193:ILE:HD12	2.03	0.40
1:A:170:ASP:O	1:A:171:LEU:O	2.39	0.40
1:A:4:GLY:CA	1:A:36:LEU:H	2.31	0.40
1:A:105:ARG:HE	1:A:107:MET:HE3	1.87	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	288/290 (99%)	254 (88%)	25 (9%)	9 (3%)	5 12

All (9) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	7	GLY
1	A	109	GLU
1	A	171	LEU
1	A	287	ASP
1	A	232	ARG
1	A	221	LYS
1	A	286	LYS
1	A	97	GLY
1	A	288	ILE

### 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	253/253 (100%)	233 (92%)	20 (8%)	15 34

All (20) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	10	VAL
1	A	38	LEU

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Mol	Chain	Res	Type
1	A	39	ASP
1	A	44	LEU
1	A	63	LEU
1	A	87	GLU
1	A	99	GLU
1	A	105	ARG
1	A	107	MET
1	A	112	ARG
1	A	129	VAL
1	A	160	ARG
1	A	175	ILE
1	A	215	ILE
1	A	226	PHE
1	A	247	GLU
1	A	267	MET
1	A	275	ASN
1	A	278	ARG
1	A	283	LYS

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (6) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	0	HIS
1	A	114	GLN
1	A	180	HIS
1	A	196	ASN
1	A	197	HIS
1	A	275	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 carbohydrates 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 [i](#)

### 6.1 Protein, DNA and RNA chains [i](#)

EDS was not executed - this section will therefore be empty.

### 6.2 Non-standard residues in protein, DNA, RNA chains [i](#)

EDS was not executed - this section will therefore be empty.

### 6.3 Carbohydrates [i](#)

EDS was not executed - this section will therefore be empty.

### 6.4 Ligands [i](#)

EDS was not executed - this section will therefore be empty.

### 6.5 Other polymers [i](#)

EDS was not executed - this section will therefore be empty.