



wwPDB X-ray Structure Validation Summary Report ⓘ

May 18, 2020 – 11:27 am BST

PDB ID : 1FPZ
Title : CRYSTAL STRUCTURE ANALYSIS OF KINASE ASSOCIATED PHOSPHATASE (KAP) WITH A SUBSTITUTION OF THE CATALYTIC SITE CYSTEINE (CYS140) TO A SERINE
Authors : Song, H.; Hanlon, N.; Brown, N.R.; Noble, M.E.M.; Johnson, L.N.; Barford, D.
Deposited on : 2000-09-01
Resolution : 2.00 Å(reported)

This is a wwPDB X-ray Structure Validation Summary 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 following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.11
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)	:	2.11

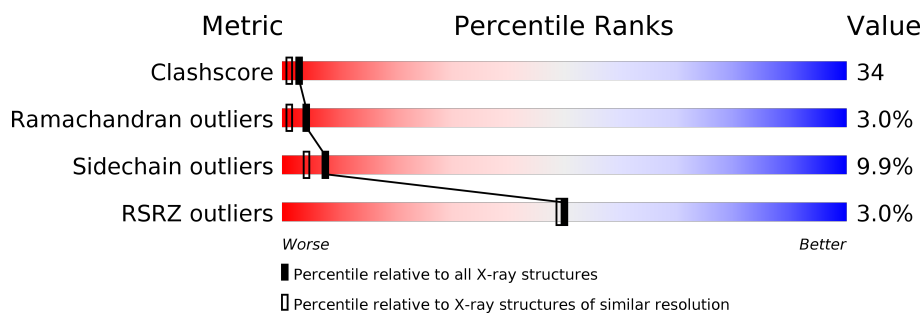
1 Overall quality at a glance ⓘ

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.00 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	141614	9178 (2.00-2.00)
Ramachandran outliers	138981	9054 (2.00-2.00)
Sidechain outliers	138945	9053 (2.00-2.00)
RSRZ outliers	127900	7900 (2.00-2.00)

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 ≥ 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	212	<div> <div>7%</div> <div>34%</div> <div>40%</div> <div>8%</div> <div>17%</div> </div>
1	B	212	<div> <div>54%</div> <div>25%</div> <div>•</div> <div>17%</div> </div>
1	C	212	<div> <div>52%</div> <div>23%</div> <div>8%</div> <div>16%</div> </div>
1	D	212	<div> <div>50%</div> <div>28%</div> <div>6%</div> <div>16%</div> </div>
1	E	212	<div> <div>49%</div> <div>30%</div> <div>•</div> <div>17%</div> </div>
1	F	212	<div> <div>7%</div> <div>36%</div> <div>38%</div> <div>8%</div> <div>•</div> <div>16%</div> </div>

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 9060 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 CYCLIN-DEPENDENT KINASE INHIBITOR 3.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	176	Total	C	N	O	S	0	0	0
			1381	871	243	255	12			
1	B	176	Total	C	N	O	S	0	0	0
			1381	871	243	255	12			
1	C	178	Total	C	N	O	S	0	0	0
			1399	881	246	260	12			
1	D	178	Total	C	N	O	S	0	0	0
			1399	881	246	260	12			
1	E	176	Total	C	N	O	S	0	0	0
			1381	871	243	255	12			
1	F	178	Total	C	N	O	S	0	0	0
			1399	881	246	260	12			

There are 6 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	140	SER	CYS	ENGINEERED MUTATION	UNP Q16667
B	140	SER	CYS	ENGINEERED MUTATION	UNP Q16667
C	140	SER	CYS	ENGINEERED MUTATION	UNP Q16667
D	140	SER	CYS	ENGINEERED MUTATION	UNP Q16667
E	140	SER	CYS	ENGINEERED MUTATION	UNP Q16667
F	140	SER	CYS	ENGINEERED MUTATION	UNP Q16667

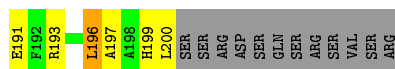
- Molecule 2 is SULFATE ION (three-letter code: SO4) (formula: O₄S).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	A	1	Total	O	S	0	0
			5	4	1		
2	B	1	Total	O	S	0	0
			5	4	1		
2	C	1	Total	O	S	0	0
			5	4	1		
2	D	1	Total	O	S	0	0
			5	4	1		
2	E	1	Total	O	S	0	0
			5	4	1		
2	F	1	Total	O	S	0	0
			5	4	1		

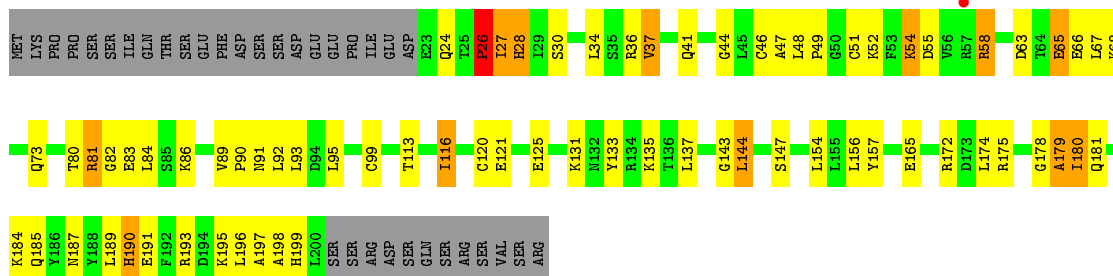
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	92	Total	O	0	0
			92	92		
3	B	99	Total	O	0	0
			99	99		
3	C	133	Total	O	0	0
			133	133		
3	D	116	Total	O	0	0
			116	116		
3	E	155	Total	O	0	0
			155	155		
3	F	95	Total	O	0	0
			95	95		



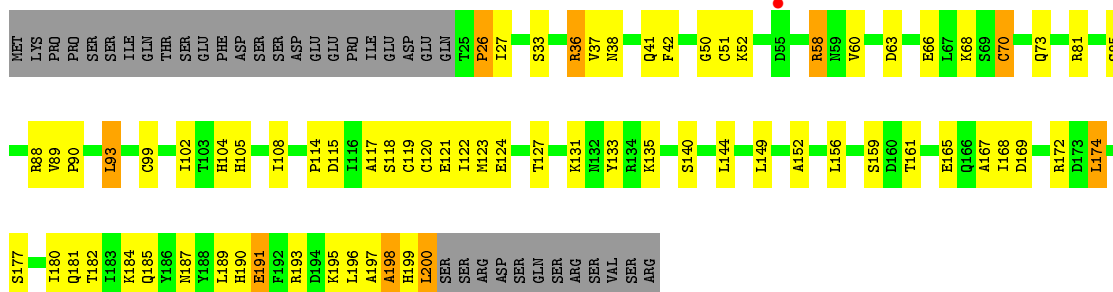
• Molecule 1: CYCLIN-DEPENDENT KINASE INHIBITOR 3

Chain D: 50% 28% 6% 16%



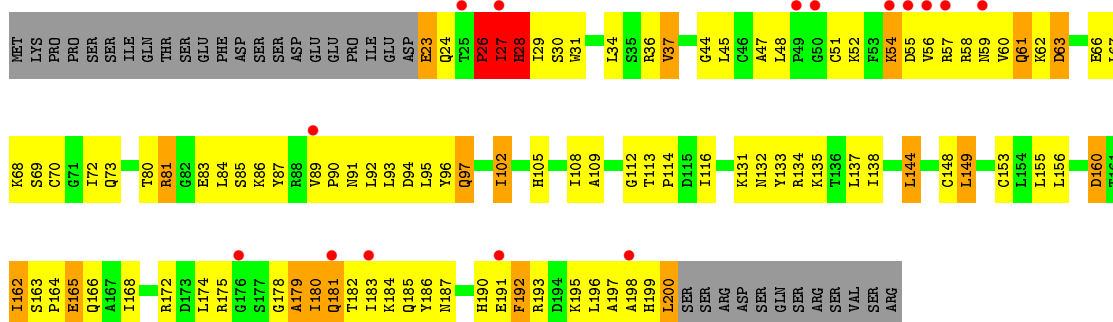
• Molecule 1: CYCLIN-DEPENDENT KINASE INHIBITOR 3

Chain E: 49% 30% 17%



• Molecule 1: CYCLIN-DEPENDENT KINASE INHIBITOR 3

Chain F: 7% 36% 38% 8% 16%



4 Data and refinement statistics

Property	Value	Source
Space group	P 65	Depositor
Cell constants a, b, c, α , β , γ	131.93Å 131.93Å 140.24Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	20.00 – 2.00 48.05 – 2.00	Depositor EDS
% Data completeness (in resolution range)	96.7 (20.00-2.00) 96.6 (48.05-2.00)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.76 (at 2.00Å)	Xtriage
Refinement program	CNS	Depositor
R, R_{free}	0.202 , 0.253 0.214 , (Not available)	Depositor DCC
R_{free} test set	No test flags present.	wwPDB-VP
Wilson B-factor (Å ²)	22.6	Xtriage
Anisotropy	0.416	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 46.0	EDS
L-test for twinning ²	$\langle L \rangle = 0.47$, $\langle L^2 \rangle = 0.30$	Xtriage
Estimated twinning fraction	0.487 for h,-h-k,-l	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	9060	wwPDB-VP
Average B, all atoms (Å ²)	31.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 55.54 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 3.1165e-05. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

¹ Intensities estimated from amplitudes.

² Theoretical 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	0.47	0/1407	0.69	0/1902
1	B	0.62	0/1407	0.78	1/1902 (0.1%)
1	C	0.60	0/1425	0.76	2/1926 (0.1%)
1	D	0.57	0/1425	0.77	1/1926 (0.1%)
1	E	0.63	1/1407 (0.1%)	0.79	1/1902 (0.1%)
1	F	0.46	0/1425	0.73	0/1926
All	All	0.56	1/8496 (0.0%)	0.75	5/11484 (0.0%)

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	C	0	1

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	E	70	CYS	CB-SG	-5.71	1.72	1.81

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	144	LEU	CA-CB-CG	5.90	128.88	115.30
1	E	144	LEU	CA-CB-CG	5.52	128.00	115.30
1	D	190	HIS	N-CA-C	-5.47	96.24	111.00
1	C	102	ILE	CG1-CB-CG2	-5.42	99.48	111.40
1	C	190	HIS	N-CA-C	-5.24	96.86	111.00

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	C	133	TYR	Sidechain

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	1381	0	1389	132	1
1	B	1381	0	1389	68	0
1	C	1399	0	1403	71	0
1	D	1399	0	1403	82	1
1	E	1381	0	1389	79	0
1	F	1399	0	1403	144	0
2	A	5	0	0	1	0
2	B	5	0	0	0	0
2	C	5	0	0	0	0
2	D	5	0	0	0	0
2	E	5	0	0	0	0
2	F	5	0	0	0	0
3	A	92	0	0	26	0
3	B	99	0	0	5	0
3	C	133	0	0	28	0
3	D	116	0	0	27	0
3	E	155	0	0	26	1
3	F	95	0	0	34	0
All	All	9060	0	8376	575	2

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 34.

The worst 5 of 575 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:B:27:ILE:HD13	1:B:66:GLU:HG2	1.31	1.11
1:C:29:ILE:HG22	3:C:988:HOH:O	1.56	1.05

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:181:GLN:HE21	1:A:181:GLN:HA	1.27	1.00
1:E:36:ARG:HH11	1:E:36:ARG:HB2	1.28	0.97
1:C:93:LEU:H	1:C:93:LEU:HD22	1.30	0.96

All (2) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:24:GLN:OE1	3:E:931:HOH:O[5_565]	2.06	0.14
1:A:61:GLN:OE1	1:A:181:GLN:O[6_554]	2.14	0.06

5.3 Torsion angles

5.3.1 Protein backbone

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	174/212 (82%)	159 (91%)	11 (6%)	4 (2%)	6	2
1	B	174/212 (82%)	165 (95%)	6 (3%)	3 (2%)	9	4
1	C	176/212 (83%)	164 (93%)	5 (3%)	7 (4%)	3	1
1	D	176/212 (83%)	158 (90%)	11 (6%)	7 (4%)	3	1
1	E	174/212 (82%)	165 (95%)	5 (3%)	4 (2%)	6	2
1	F	176/212 (83%)	154 (88%)	15 (8%)	7 (4%)	3	1
All	All	1050/1272 (82%)	965 (92%)	53 (5%)	32 (3%)	4	1

5 of 32 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	26	PRO
1	B	26	PRO
1	B	198	ALA
1	C	27	ILE

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Mol	Chain	Res	Type
1	C	54	LYS

5.3.2 Protein sidechains ⓘ

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	155/191 (81%)	133 (86%)	22 (14%)	3	1
1	B	155/191 (81%)	146 (94%)	9 (6%)	20	15
1	C	157/191 (82%)	139 (88%)	18 (12%)	5	3
1	D	157/191 (82%)	147 (94%)	10 (6%)	17	13
1	E	155/191 (81%)	142 (92%)	13 (8%)	11	7
1	F	157/191 (82%)	136 (87%)	21 (13%)	4	2
All	All	936/1146 (82%)	843 (90%)	93 (10%)	8	4

5 of 93 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	140	SER
1	D	65	GLU
1	F	149	LEU
1	C	147	SER
1	C	196	LEU

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 31 such sidechains are listed below:

Mol	Chain	Res	Type
1	C	187	ASN
1	D	41	GLN
1	F	97	GLN
1	D	28	HIS
1	D	73	GLN

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 ⓘ

6 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	$\# Z > 2$
2	SO4	B	901	-	4,4,4	0.19	0	6,6,6	0.34	0
2	SO4	F	905	-	4,4,4	0.28	0	6,6,6	0.18	0
2	SO4	A	900	-	4,4,4	0.18	0	6,6,6	0.49	0
2	SO4	E	904	-	4,4,4	0.18	0	6,6,6	0.38	0
2	SO4	D	903	-	4,4,4	0.18	0	6,6,6	0.28	0
2	SO4	C	902	-	4,4,4	0.39	0	6,6,6	0.33	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.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	900	SO4	1	0

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	176/212 (83%)	0.53	15 (8%) 10 10	14, 44, 75, 78	0
1	B	176/212 (83%)	-0.46	0 100 100	10, 21, 45, 64	0
1	C	178/212 (83%)	-0.36	0 100 100	13, 23, 41, 58	0
1	D	178/212 (83%)	-0.35	1 (0%) 89 88	10, 25, 42, 63	0
1	E	176/212 (83%)	-0.45	1 (0%) 89 88	10, 21, 42, 59	0
1	F	178/212 (83%)	0.52	15 (8%) 11 10	13, 45, 74, 83	0
All	All	1062/1272 (83%)	-0.09	32 (3%) 50 49	10, 26, 63, 83	0

The worst 5 of 32 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	183	ILE	5.2
1	F	183	ILE	4.8
1	A	178	GLY	4.7
1	F	198	ALA	4.5
1	A	56	VAL	4.5

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 carbohydrates 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
2	SO4	F	905	5/5	0.92	0.12	55,56,57,57	0
2	SO4	A	900	5/5	0.96	0.14	28,32,33,34	0
2	SO4	E	904	5/5	0.98	0.10	30,32,33,34	0
2	SO4	B	901	5/5	0.99	0.10	11,12,14,16	0
2	SO4	D	903	5/5	0.99	0.10	15,15,15,18	0
2	SO4	C	902	5/5	0.99	0.09	17,17,18,21	0

6.5 Other polymers [i](#)

There are no such residues in this entry.