



wwPDB X-ray Structure Validation Summary Report ⓘ

Sep 16, 2021 – 02:02 pm BST

PDB ID : 7B4J
Title : Thermostable omega transaminase PjTA-R6 variant W58M/F86L/R417L engineered for asymmetric synthesis of enantiopure bulky amines
Authors : Capra, N.; Rozeboom, H.J.; Thunnissen, A.M.W.H.; Janssen, D.B.
Deposited on : 2020-12-02
Resolution : 1.90 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)
Xtrriage (Phenix) : **NOT EXECUTED**
EDS : **NOT EXECUTED**
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.23.1

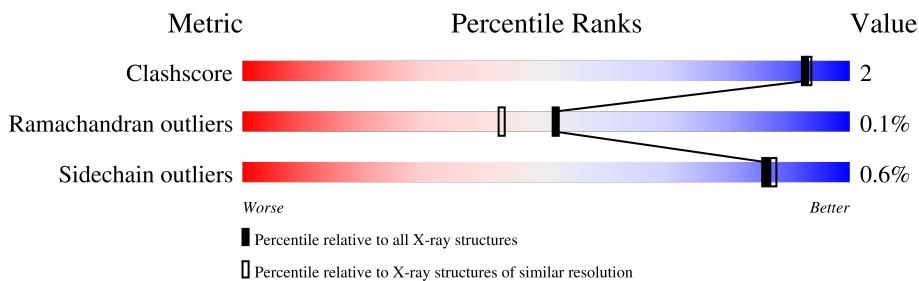
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.90 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	6847 (1.90-1.90)
Ramachandran outliers	138981	6760 (1.90-1.90)
Sidechain outliers	138945	6760 (1.90-1.90)

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 $\leq 5\%$.

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	464	93%
1	B	464	93%

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 7362 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 Aspartate aminotransferase family protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	449	3452	2206	596	633	17	0	1	0
1	B	452	3472	2217	599	639	17	0	2	0

There are 36 discrepancies between the modelled and reference sequences:

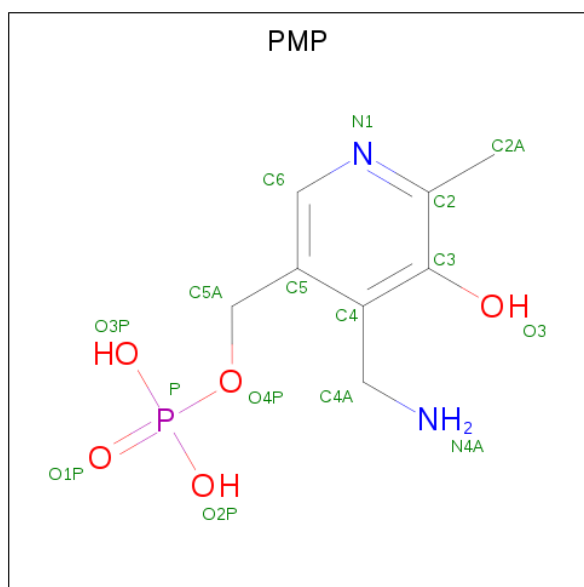
Chain	Residue	Modelled	Actual	Comment	Reference
A	9	ALA	PRO	engineered mutation	UNP A0A2D8IND4
A	38	GLN	GLU	engineered mutation	UNP A0A2D8IND4
A	58	MET	TRP	engineered mutation	UNP A0A2D8IND4
A	60	VAL	ALA	engineered mutation	UNP A0A2D8IND4
A	86	LEU	PHE	engineered mutation	UNP A0A2D8IND4
A	87	ASN	SER	engineered mutation	UNP A0A2D8IND4
A	128	PHE	MET	engineered mutation	UNP A0A2D8IND4
A	154	VAL	ILE	engineered mutation	UNP A0A2D8IND4
A	417	LEU	ARG	engineered mutation	UNP A0A2D8IND4
A	456	PRO	-	expression tag	UNP A0A2D8IND4
A	457	GLY	-	expression tag	UNP A0A2D8IND4
A	458	GLY	-	expression tag	UNP A0A2D8IND4
A	459	HIS	-	expression tag	UNP A0A2D8IND4
A	460	HIS	-	expression tag	UNP A0A2D8IND4
A	461	HIS	-	expression tag	UNP A0A2D8IND4
A	462	HIS	-	expression tag	UNP A0A2D8IND4
A	463	HIS	-	expression tag	UNP A0A2D8IND4
A	464	HIS	-	expression tag	UNP A0A2D8IND4
B	9	ALA	PRO	engineered mutation	UNP A0A2D8IND4
B	38	GLN	GLU	engineered mutation	UNP A0A2D8IND4
B	58	MET	TRP	engineered mutation	UNP A0A2D8IND4
B	60	VAL	ALA	engineered mutation	UNP A0A2D8IND4
B	86	LEU	PHE	engineered mutation	UNP A0A2D8IND4
B	87	ASN	SER	engineered mutation	UNP A0A2D8IND4
B	128	PHE	MET	engineered mutation	UNP A0A2D8IND4

Continued on next page...

Continued from previous page...

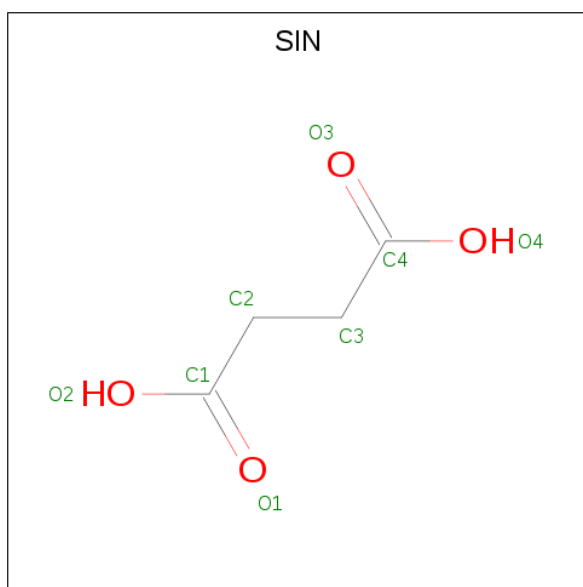
Chain	Residue	Modelled	Actual	Comment	Reference
B	154	VAL	ILE	engineered mutation	UNP A0A2D8IND4
B	417	LEU	ARG	engineered mutation	UNP A0A2D8IND4
B	456	PRO	-	expression tag	UNP A0A2D8IND4
B	457	GLY	-	expression tag	UNP A0A2D8IND4
B	458	GLY	-	expression tag	UNP A0A2D8IND4
B	459	HIS	-	expression tag	UNP A0A2D8IND4
B	460	HIS	-	expression tag	UNP A0A2D8IND4
B	461	HIS	-	expression tag	UNP A0A2D8IND4
B	462	HIS	-	expression tag	UNP A0A2D8IND4
B	463	HIS	-	expression tag	UNP A0A2D8IND4
B	464	HIS	-	expression tag	UNP A0A2D8IND4

- Molecule 2 is 4'-DEOXY-4'-AMINOPYRIDOXAL-5'-PHOSPHATE (three-letter code: PMP) (formula: C₈H₁₃N₂O₅P).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total	C	N	O	P	0	0
			16	8	2	5	1		
2	B	1	Total	C	N	O	P	0	0
			16	8	2	5	1		

- Molecule 3 is SUCCINIC ACID (three-letter code: SIN) (formula: C₄H₆O₄).



Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	B	1	Total	C O	0	0
			8	4 4		

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	169	Total	O	0	8
			177	177		
4	B	213	Total	O	0	8
			221	221		

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. 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. 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: Aspartate aminotransferase family protein

Chain A:  93%



- Molecule 1: Aspartate aminotransferase family protein

Chain B:  93%



4 Data and refinement statistics

Xtrriage (Phenix) and EDS were not executed - this section is therefore incomplete.

Property	Value	Source
Space group	P 43	Depositor
Cell constants a, b, c, α , β , γ	97.82Å 97.82Å 118.72Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	50.80 – 1.90	Depositor
% Data completeness (in resolution range)	100.0 (50.80-1.90)	Depositor
R_{merge}	0.05	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	REFMAC 5.8.0258	Depositor
R, R_{free}	0.178 , 0.208	Depositor
Estimated twinning fraction	No twinning to report.	Xtrriage
Total number of atoms	7362	wwPDB-VP
Average B, all atoms (Å ²)	36.0	wwPDB-VP

5 Model quality [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: PMP, SIN

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	0.69	0/3530	0.77	0/4783
1	B	0.69	0/3551	0.78	0/4812
All	All	0.69	0/7081	0.77	0/9595

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	3452	0	3440	12	0
1	B	3472	0	3453	10	0
2	A	16	0	11	0	0
2	B	16	0	10	0	0
3	B	8	0	4	0	0
4	A	177	0	0	2	0
4	B	221	0	0	0	0
All	All	7362	0	6918	21	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 2.

The worst 5 of 21 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:87:ASN:HB3	4:A:1750:HOH:O	1.93	0.69
1:B:419:MET:CE	1:B:424:ALA:HB2	2.25	0.67
1:B:419:MET:HE1	1:B:424:ALA:HB2	1.77	0.66
1:A:419:MET:CE	1:A:424:ALA:HB2	2.32	0.59
1:A:419:MET:HE1	1:A:424:ALA:HB2	1.92	0.51

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	448/464 (97%)	429 (96%)	19 (4%)	0	100	100
1	B	452/464 (97%)	430 (95%)	21 (5%)	1 (0%)	47	38
All	All	900/928 (97%)	859 (95%)	40 (4%)	1 (0%)	51	42

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	264	PHE

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	359/371 (97%)	358 (100%)	1 (0%)	92	93
1	B	361/371 (97%)	358 (99%)	3 (1%)	81	82
All	All	720/742 (97%)	716 (99%)	4 (1%)	86	87

All (4) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	52	GLU
1	B	52	GLU
1	B	147	ARG
1	B	311	ASP

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 7 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	167	ASN
1	B	198	HIS
1	B	396	GLN
1	B	312	GLN
1	B	87	ASN

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](#)

3 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	SIN	B	1101	-	1,7,7	0.12	0	2,8,8	1.53	1 (50%)
2	PMP	A	1501	-	16,16,16	1.10	2 (12%)	21,23,23	1.00	1 (4%)
2	PMP	B	1102	-	16,16,16	0.77	0	21,23,23	0.82	0

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	SIN	B	1101	-	-	0/1/5/5	-
2	PMP	A	1501	-	-	5/8/8/8	0/1/1/1
2	PMP	B	1102	-	-	3/8/8/8	0/1/1/1

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	1501	PMP	C3-C2	2.31	1.43	1.40
2	A	1501	PMP	P-O4P	2.01	1.66	1.60

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	B	1101	SIN	C3-C2-C1	2.14	116.26	112.67
2	A	1501	PMP	C5A-C5-C6	2.02	122.69	119.37

There are no chirality outliers.

5 of 8 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	1501	PMP	C3-C4-C4A-N4A
2	A	1501	PMP	C5-C4-C4A-N4A
2	A	1501	PMP	C5A-O4P-P-O3P
2	B	1102	PMP	C3-C4-C4A-N4A
2	B	1102	PMP	C5-C4-C4A-N4A

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

EDS was not executed - this section is therefore empty.

6.2 Non-standard residues in protein, DNA, RNA chains

EDS was not executed - this section is therefore empty.

6.3 Carbohydrates

EDS was not executed - this section is therefore empty.

6.4 Ligands

EDS was not executed - this section is therefore empty.

6.5 Other polymers

EDS was not executed - this section is therefore empty.