



# wwPDB X-ray Structure Validation Summary Report ⓘ

Jul 26, 2023 – 05:41 AM EDT

PDB ID : 1BHW  
Title : LOW TEMPERATURE MIDDLE RESOLUTION STRUCTURE OF XY-LOSE ISOMERASE FROM MASC DATA  
Authors : Ramin, M.; Shepard, W.; Fourme, R.; Kahn, R.  
Deposited on : 1998-06-10  
Resolution : 4.10 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](mailto: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>.

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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  
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) : 2.34

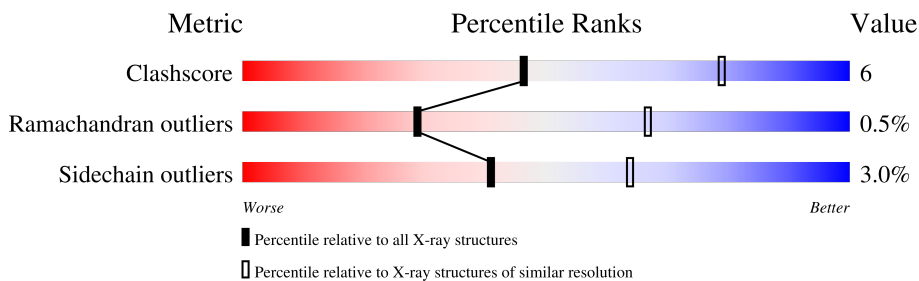
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 4.10 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	1003 (4.44-3.76)
Ramachandran outliers	138981	1005 (4.48-3.72)
Sidechain outliers	138945	1199 (4.50-3.70)

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 of the lower bar indicate the fraction of residues that contain outliers for  $\geq 3$ , 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	393	
1	B	393	
1	C	393	
1	D	393	

## 2 Entry composition

There is only 1 type of molecule in this entry. The entry contains 12248 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 XYLOSE ISOMERASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	392	3062	1942	533	583	4	0	0	0
1	B	392	3062	1942	533	583	4	0	0	0
1	C	392	3062	1942	533	583	4	0	0	0
1	D	392	3062	1942	533	583	4	0	0	0

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	220	ASN	HIS	conflict	UNP P12851
B	220	ASN	HIS	conflict	UNP P12851
C	220	ASN	HIS	conflict	UNP P12851
D	220	ASN	HIS	conflict	UNP P12851

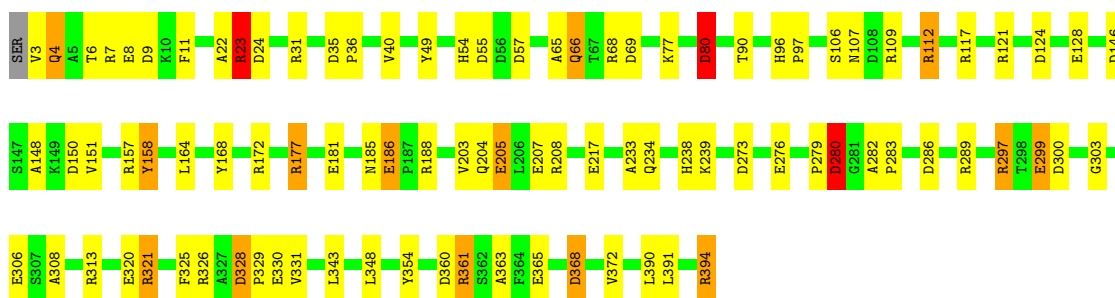
### 3 Residue-property plots [i](#)

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.

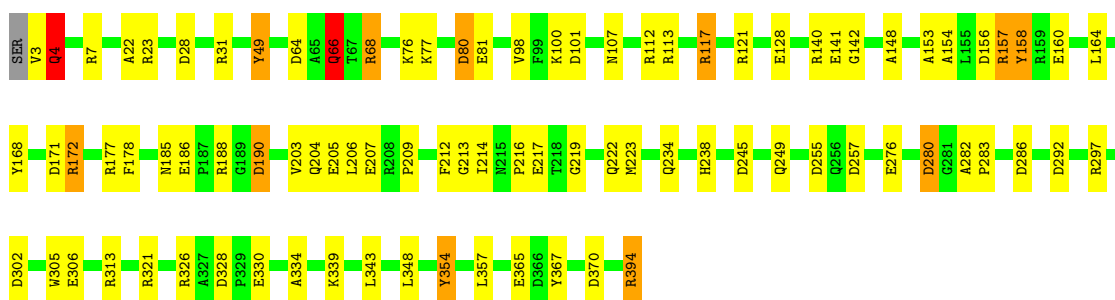
- Molecule 1: XYLOSE ISOMERASE

Chain A:  76% 20%




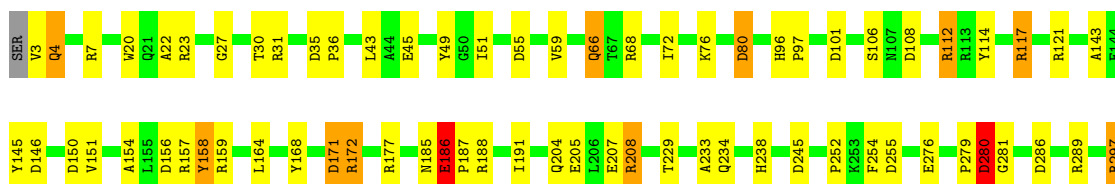
- Molecule 1: XYLOSE ISOMERASE

Chain B:  77% 19%



- Molecule 1: XYLOSE ISOMERASE

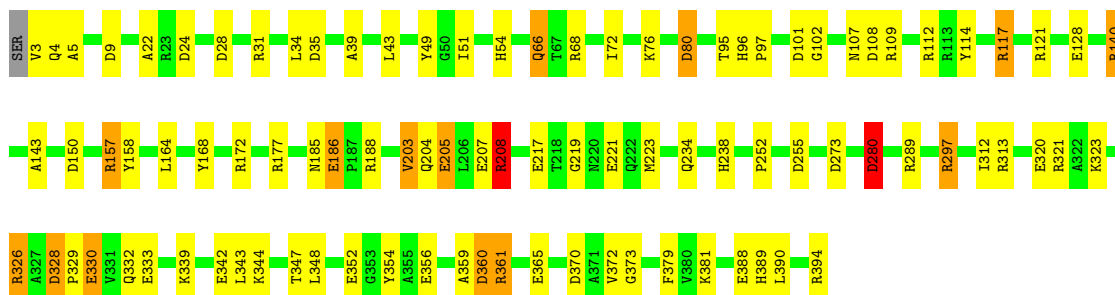
Chain C:  79% 18%





- Molecule 1: XYLOSE ISOMERASE

Chain D: 76% 20%



## 4 Data and refinement statistics

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

Property	Value	Source
Space group	P 32 2 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	141.91Å 141.91Å 227.48Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	8.00 – 4.10	Depositor
% Data completeness (in resolution range)	(Not available) (8.00-4.10)	Depositor
$R_{merge}$	0.04	Depositor
$R_{sym}$	0.04	Depositor
Refinement program	X-PLOR 3.1	Depositor
R, $R_{free}$	0.315 , 0.321	Depositor
Estimated twinning fraction	No twinning to report.	Xtrriage
Total number of atoms	12248	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	20.0	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	2.12	11/3133 (0.4%)	2.72	85/4243 (2.0%)
1	B	1.97	11/3133 (0.4%)	2.66	70/4243 (1.6%)
1	C	2.09	13/3133 (0.4%)	2.74	71/4243 (1.7%)
1	D	1.96	12/3133 (0.4%)	2.65	74/4243 (1.7%)
All	All	2.04	47/12532 (0.4%)	2.69	300/16972 (1.8%)

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	2
1	B	0	1
1	C	0	1
1	D	0	1
All	All	0	5

The worst 5 of 47 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	D	4	GLN	CG-CD	-47.80	0.41	1.51
1	C	4	GLN	CG-CD	-46.65	0.43	1.51
1	A	66	GLN	CG-CD	-46.63	0.43	1.51
1	C	66	GLN	CG-CD	-46.63	0.43	1.51
1	A	4	GLN	CG-CD	-45.34	0.46	1.51

The worst 5 of 300 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	280	ASP	CB-CG-OD2	58.83	171.25	118.30
1	D	280	ASP	OD1-CG-OD2	-58.57	12.02	123.30
1	C	280	ASP	CB-CG-OD2	57.08	169.67	118.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	66	GLN	OE1-CD-NE2	-53.00	0.00	121.90
1	A	66	GLN	OE1-CD-NE2	-52.98	0.05	121.90

There are no chirality outliers.

All (5) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	23	ARG	Sidechain
1	A	280	ASP	Sidechain
1	B	172	ARG	Sidechain
1	C	172	ARG	Sidechain
1	D	208	ARG	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	3062	0	2967	58	0
1	B	3062	0	2967	58	0
1	C	3062	0	2964	39	0
1	D	3062	0	2967	60	0
All	All	12248	0	11865	151	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 6.

The worst 5 of 151 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:66:GLN:CD	1:A:66:GLN:C	1.97	1.22
1:A:66:GLN:CD	1:A:66:GLN:HB2	1.61	1.18
1:A:66:GLN:CD	1:A:66:GLN:N	1.99	1.15
1:A:66:GLN:CD	1:A:66:GLN:HB3	1.69	1.12
1:D:208:ARG:HG2	1:D:208:ARG:HH11	1.27	1.00

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	390/393 (99%)	376 (96%)	13 (3%)	1 (0%)	41	75
1	B	390/393 (99%)	376 (96%)	13 (3%)	1 (0%)	41	75
1	C	390/393 (99%)	374 (96%)	12 (3%)	4 (1%)	15	52
1	D	390/393 (99%)	378 (97%)	10 (3%)	2 (0%)	29	67
All	All	1560/1572 (99%)	1504 (96%)	48 (3%)	8 (0%)	29	67

5 of 8 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	280	ASP
1	A	186	GLU
1	B	186	GLU
1	C	186	GLU
1	C	279	PRO

### 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	309/310 (100%)	299 (97%)	10 (3%)	39	62
1	B	309/310 (100%)	301 (97%)	8 (3%)	46	67
1	C	309/310 (100%)	301 (97%)	8 (3%)	46	67
1	D	309/310 (100%)	298 (96%)	11 (4%)	35	60
All	All	1236/1240 (100%)	1199 (97%)	37 (3%)	41	64

5 of 37 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	D	66	GLN
1	D	323	LYS
1	D	80	ASP
1	D	203	VAL
1	B	66	GLN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 17 such sidechains are listed below:

Mol	Chain	Res	Type
1	D	185	ASN
1	D	238	HIS
1	B	238	HIS
1	C	4	GLN
1	C	185	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](#)

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

The following chains have linkage breaks:

Mol	Chain	Number of breaks
1	C	1
1	D	1

All chain breaks are listed below:

Model	Chain	Residue-1	Atom-1	Residue-2	Atom-2	Distance (Å)
1	C	328:ASP	C	329:PRO	N	1.15
1	D	328:ASP	C	329:PRO	N	1.13

## 6 Fit of model and data [i](#)

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

EDS was not executed - this section is therefore empty.

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

EDS was not executed - this section is therefore empty.

### 6.3 Carbohydrates [i](#)

EDS was not executed - this section is therefore empty.

### 6.4 Ligands [i](#)

EDS was not executed - this section is therefore empty.

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

EDS was not executed - this section is therefore empty.