



# wwPDB X-ray Structure Validation Summary Report ⓘ

May 16, 2020 – 08:34 pm BST

PDB ID : 1SPI  
Title : CRYSTAL STRUCTURE OF SPINACH CHLOROPLAST FRUCTOSE-1,6-BISPHOSPHATASE AT 2.8 ANGSTROMS RESOLUTION  
Authors : Villeret, V.; Huang, S.; Zhang, Y.; Xue, Y.; Lipscomb, W.N.  
Deposited on : 1994-12-14  
Resolution : 2.80 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.

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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
Xtriage (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)	:	2.11

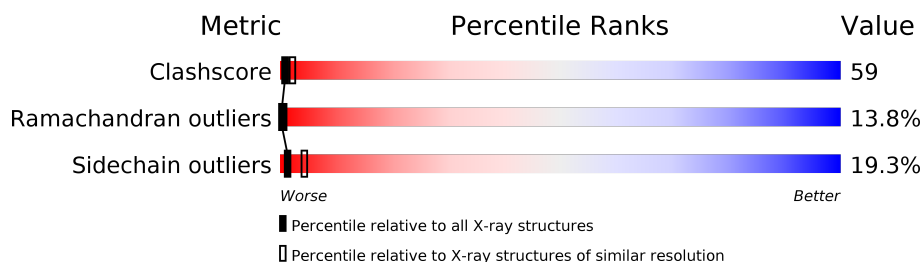
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

## *X-RAY DIFFRACTION*

The reported resolution of this entry is 2.80 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	3569 (2.80-2.80)
Ramachandran outliers	138981	3498 (2.80-2.80)
Sidechain outliers	138945	3500 (2.80-2.80)

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 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	358	
1	B	358	
1	C	358	
1	D	358	

## 2 Entry composition

There is only 1 type of molecule in this entry. The entry contains 12334 atoms, of which 2181 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 FRUCTOSE 1,6-BISPHOSPHATASE.

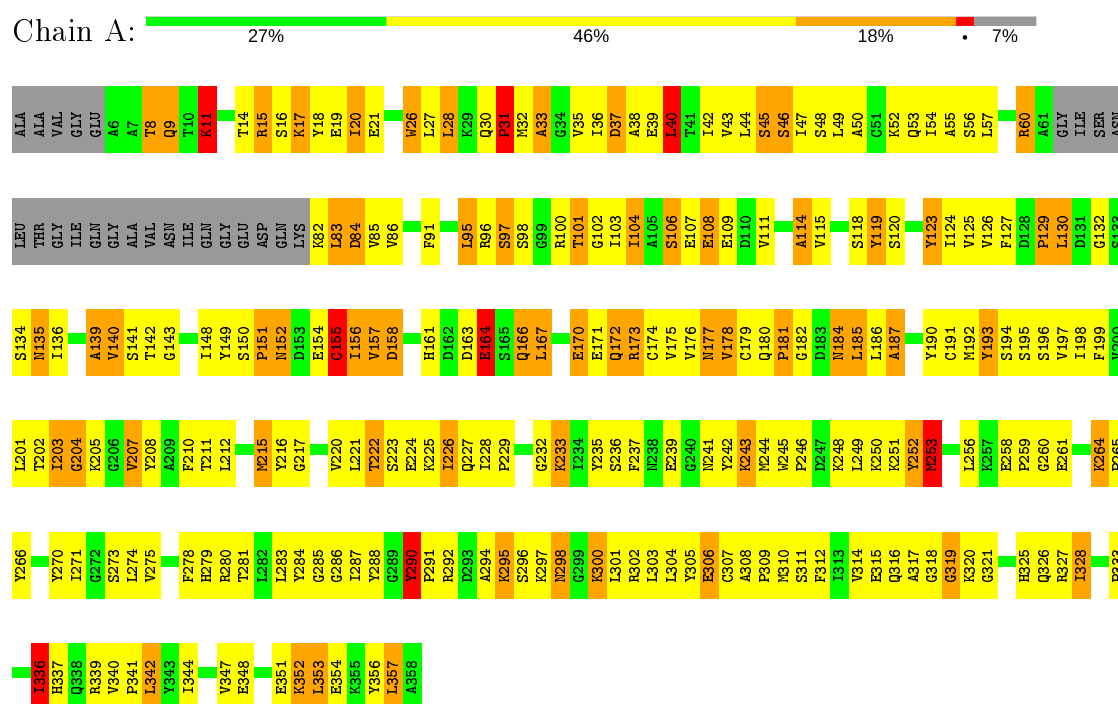
Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	333	Total	C	H	N	O	S	0	0	0
			3138	1631	560	422	512	13			
1	B	328	Total	C	H	N	O	S	0	0	0
			3050	1594	535	409	499	13			
1	C	328	Total	C	H	N	O	S	0	0	0
			3050	1594	535	409	499	13			
1	D	328	Total	C	H	N	O	S	0	0	0
			3096	1612	551	416	504	13			

### 3 Residue-property plots

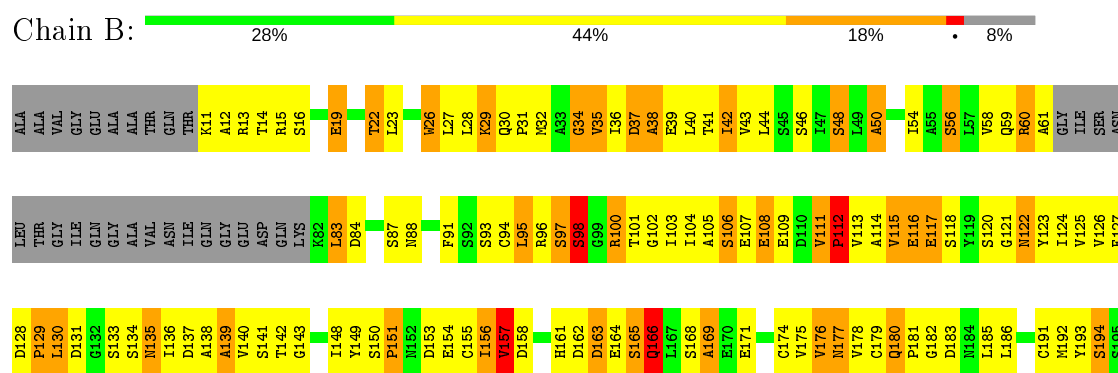
These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry. Residues are color-coded according 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.

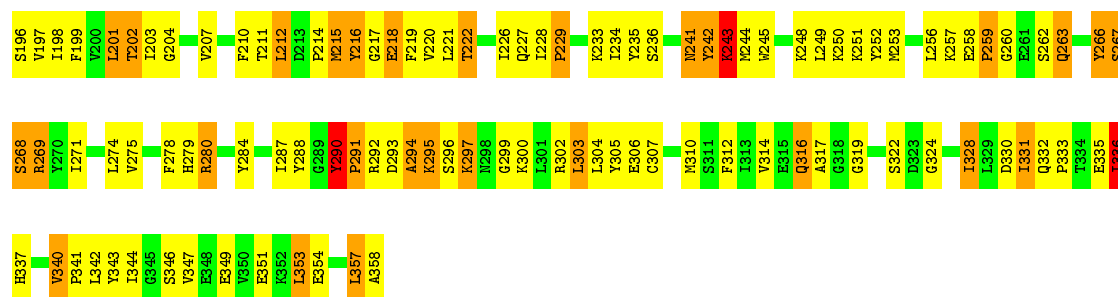
Note EDS was not executed.

#### • Molecule 1: FRUCTOSE 1,6-BISPHOSPHATASE

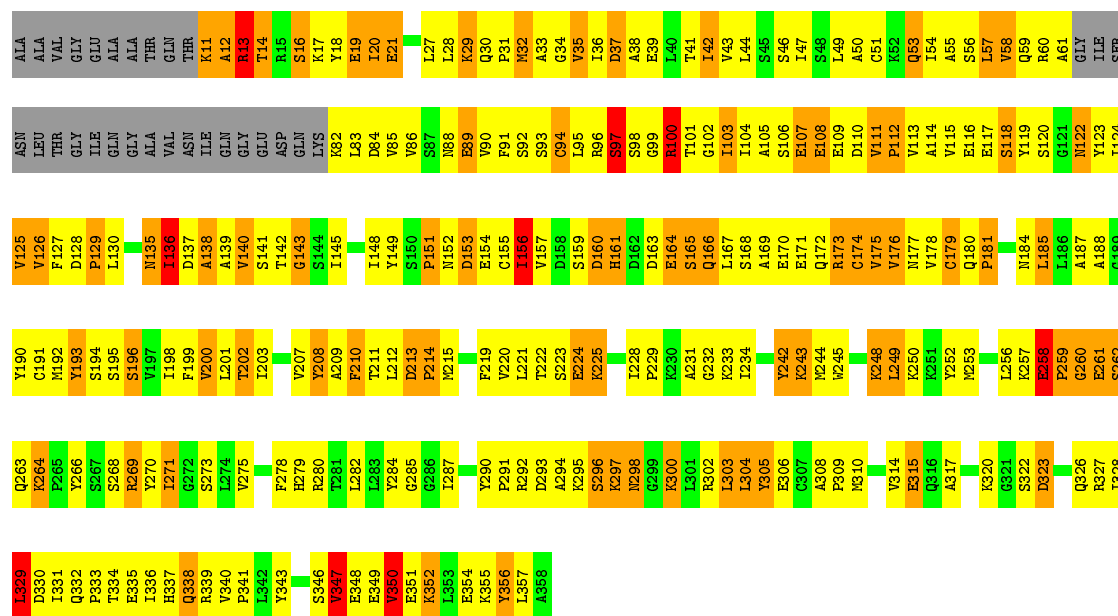
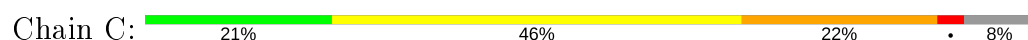


#### • Molecule 1: FRUCTOSE 1,6-BISPHOSPHATASE

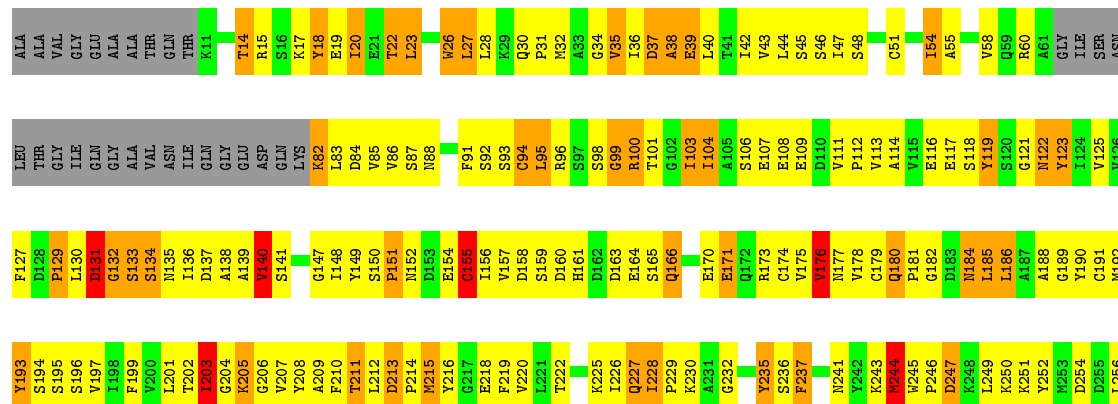
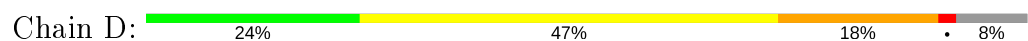


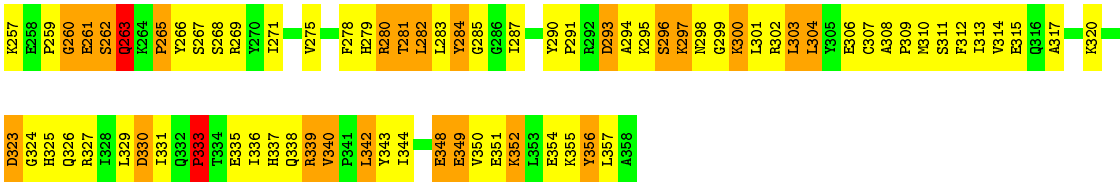


• Molecule 1: FRUCTOSE 1,6-BISPHOSPHATASE



• Molecule 1: FRUCTOSE 1,6-BISPHOSPHATASE





## 4 Data and refinement statistics

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

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	76.10 Å   85.70 Å   105.80 Å 90.00°   103.10°   90.00°	Depositor
Resolution (Å)	6.00 – 2.80	Depositor
% Data completeness (in resolution range)	(Not available) (6.00-2.80)	Depositor
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
Refinement program	X-PLOR	Depositor
R, $R_{free}$	0.203 , (Not available)	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	12334	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	28.0	wwPDB-VP

## 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	0.87	4/2626 (0.2%)	1.06	7/3550 (0.2%)
1	B	0.87	0/2562	1.03	3/3466 (0.1%)
1	C	0.88	4/2562 (0.2%)	1.02	5/3466 (0.1%)
1	D	0.88	3/2593 (0.1%)	1.02	5/3504 (0.1%)
All	All	0.88	11/10343 (0.1%)	1.03	20/13986 (0.1%)

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	3
1	B	0	2
1	C	0	2
1	D	0	4
All	All	0	11

The worst 5 of 11 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	11	LYS	CD-CE	10.50	1.77	1.51
1	C	13	ARG	N-CA	8.97	1.64	1.46
1	D	155	CYS	CB-SG	7.20	1.94	1.82
1	C	11	LYS	CB-CG	6.39	1.69	1.52
1	D	244	MET	CG-SD	6.12	1.97	1.81

The worst 5 of 20 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	11	LYS	CD-CE-NZ	12.37	140.16	111.70
1	C	11	LYS	C-N-CA	7.42	140.25	121.70
1	D	201	LEU	CA-CB-CG	6.87	131.09	115.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	11	LYS	CA-CB-CG	6.58	127.88	113.40
1	D	23	LEU	CA-CB-CG	6.10	129.33	115.30

There are no chirality outliers.

5 of 11 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	193	TYR	Sidechain
1	A	252	TYR	Sidechain
1	A	290	TYR	Sidechain
1	B	266	TYR	Sidechain
1	B	290	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	2578	560	2546	341	0
1	B	2515	535	2462	303	0
1	C	2515	535	2461	307	0
1	D	2545	551	2514	297	0
All	All	10153	2181	9983	1182	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 59.

The worst 5 of 1182 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:11:LYS:CD	1:A:11:LYS:CE	1.77	1.58
1:C:215:MET:CE	1:C:215:MET:SD	2.02	1.47
1:C:100:ARG:HD2	1:C:123:TYR:HD2	1.10	1.09
1:C:175:VAL:HG11	1:C:336:ILE:HD11	1.37	1.06
1:B:215:MET:SD	1:D:215:MET:HG3	1.97	1.05

There are no symmetry-related clashes.

## 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	329/358 (92%)	211 (64%)	77 (23%)	41 (12%)	0	1
1	B	324/358 (90%)	210 (65%)	73 (22%)	41 (13%)	0	1
1	C	324/358 (90%)	195 (60%)	73 (22%)	56 (17%)	0	0
1	D	324/358 (90%)	199 (61%)	83 (26%)	42 (13%)	0	1
All	All	1301/1432 (91%)	815 (63%)	306 (24%)	180 (14%)	0	0

5 of 180 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	20	ILE
1	A	31	PRO
1	A	33	ALA
1	A	38	ALA
1	A	83	LEU

### 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	285/302 (94%)	237 (83%)	48 (17%)	2	6
1	B	275/302 (91%)	213 (78%)	62 (22%)	1	2
1	C	275/302 (91%)	219 (80%)	56 (20%)	1	4
1	D	282/302 (93%)	232 (82%)	50 (18%)	2	5
All	All	1117/1208 (92%)	901 (81%)	216 (19%)	1	4

5 of 216 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	284	TYR
1	C	118	SER
1	D	228	ILE
1	B	291	PRO
1	B	357	LEU

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 28 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	316	GLN
1	C	166	GLN
1	D	184	ASN
1	B	337	HIS
1	C	135	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 carbohydrates 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 ⓘ

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.