



# Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 12:00 PM UTC

PDB ID : 2WPS / pdb\_00002wps  
Title : Salmonella enterica SadA 483-523 fused to GCN4 adaptors (SadAK3b-V2, out-of-register fusion)  
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Deposited on : 2009-08-09  
Resolution : 2.60 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

<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 : 4-5-2 with Phenix2.0  
Xtriage (Phenix) : 2.0  
EDS : 3.0  
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)  
CCP4 : 9.0.010 (Gargrove)  
Density-Fitness : 1.0.12  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.49

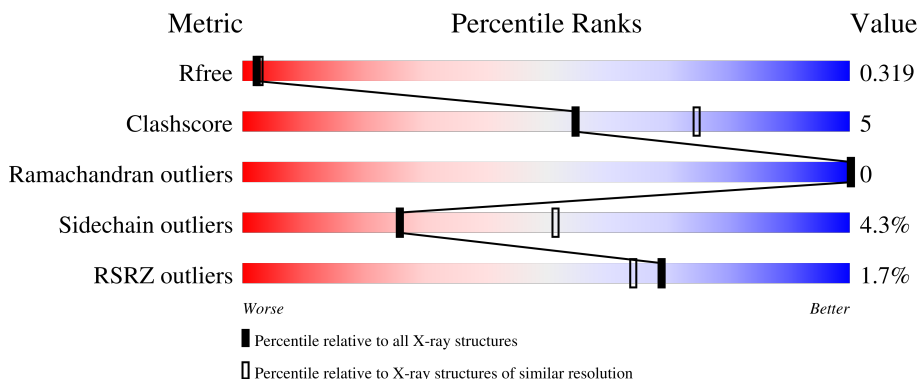
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.60 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))
$R_{free}$	180053	4008 (2.60-2.60)
Clashscore	190562	4347 (2.60-2.60)
Ramachandran outliers	187476	4277 (2.60-2.60)
Sidechain outliers	187428	4277 (2.60-2.60)
RSRZ outliers	180081	4008 (2.60-2.60)

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  $\leq 5\%$ . 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	107	 2% 80% 11% 8%
1	B	107	 80% 11% 8%
1	C	107	 3% 77% 15% 8%

## 2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 2442 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 TRIMERIC AUTOTRANSPORTER ADHESIN FRAGMENT.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	98	782	486	131	164	1	0	0	0
1	B	98	794	494	134	165	1	0	0	0
1	C	98	789	491	132	165	1	0	0	0

- Molecule 2 is CHLORIDE ION (CCD ID: CL) (formula: Cl).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	3	Total	Cl	0	0
			3	3		
2	C	1	Total	Cl	0	0
			1	1		

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	28	Total	O	0	0
			28	28		
3	B	19	Total	O	0	0
			19	19		
3	C	26	Total	O	0	0
			26	26		



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	36.66Å 55.85Å 168.95Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	35.83 – 2.60 35.83 – 2.60	Depositor EDS
% Data completeness (in resolution range)	98.7 (35.83-2.60) 98.9 (35.83-2.60)	Depositor EDS
$R_{merge}$	0.13	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.32 (at 2.61Å)	Xtrriage
Refinement program	REFMAC 5.2.0019	Depositor
R, $R_{free}$	0.238 , 0.324 0.240 , 0.319	Depositor DCC
$R_{free}$ test set	577 reflections (5.16%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	27.8	Xtrriage
Anisotropy	0.224	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.31 , 27.9	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.52$ , $\langle L^2 \rangle = 0.36$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.93	EDS
Total number of atoms	2442	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	33.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 12.73% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>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 [i](#)

### 5.1 Standard geometry [i](#)

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

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	0.98	0/785	0.94	0/1061
1	B	0.86	0/797	0.91	0/1074
1	C	0.89	0/792	0.96	0/1069
All	All	0.91	0/2374	0.94	0/3204

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	782	0	797	15	0
1	B	794	0	825	12	0
1	C	789	0	809	10	0
2	A	3	0	0	0	0
2	C	1	0	0	0	0
3	A	28	0	0	1	0
3	B	19	0	0	0	0
3	C	26	0	0	0	0
All	All	2442	0	2431	23	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 5.

All (23) 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:524:MET:HG2	1:C:523:LEU:HD13	1.78	0.63
1:C:525:LYS:HG2	1:C:526:GLN:N	2.14	0.62
1:A:530:LYS:NZ	1:B:535:LEU:HD11	2.18	0.59
1:C:521:THR:HA	1:C:524:MET:HE2	1.84	0.59
1:A:527:ILE:HD13	1:B:527:ILE:HD13	1.85	0.58
1:A:478:ILE:HD13	1:B:478:ILE:HG22	1.87	0.56
1:A:473:ASN:ND2	3:A:2004:HOH:O	2.25	0.54
1:A:471:ILE:HG23	1:B:475:ILE:HD11	1.92	0.52
1:A:478:ILE:HG21	1:C:478:ILE:HG21	1.95	0.47
1:A:527:ILE:CD1	1:B:527:ILE:HD13	2.46	0.46
1:A:478:ILE:HD13	1:B:478:ILE:CG2	2.46	0.45
1:A:478:ILE:HG21	1:B:478:ILE:CG2	2.48	0.44
1:B:523:LEU:HD13	1:C:524:MET:HG2	1.99	0.43
1:C:487:GLN:NE2	1:C:491:ASP:OD1	2.51	0.43
1:B:521:THR:HA	1:B:524:MET:HE2	2.00	0.43
1:A:521:THR:HA	1:A:524:MET:HE2	2.01	0.42
1:A:523:LEU:HD11	1:A:527:ILE:HD11	2.00	0.42
1:C:456:GLN:OE1	1:C:460:LYS:HE2	2.19	0.42
1:A:527:ILE:HD13	1:C:527:ILE:HD13	2.01	0.41
1:B:478:ILE:HG21	1:C:478:ILE:CG2	2.51	0.41
1:C:530:LYS:NZ	1:C:533:GLU:OE2	2.53	0.41
1:A:523:LEU:HD13	1:B:524:MET:HG2	2.01	0.41
1:A:471:ILE:HG23	1:B:475:ILE:CD1	2.50	0.41

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	96/107 (90%)	94 (98%)	2 (2%)	0	100	100
1	B	96/107 (90%)	95 (99%)	1 (1%)	0	100	100
1	C	96/107 (90%)	95 (99%)	1 (1%)	0	100	100
All	All	288/321 (90%)	284 (99%)	4 (1%)	0	100	100

There are no Ramachandran outliers to report.

### 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	91/103 (88%)	87 (96%)	4 (4%)	25	50
1	B	94/103 (91%)	89 (95%)	5 (5%)	20	43
1	C	92/103 (89%)	89 (97%)	3 (3%)	33	61
All	All	277/309 (90%)	265 (96%)	12 (4%)	26	51

All (12) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	466	SER
1	A	481	LEU
1	A	516	LEU
1	A	551	LEU
1	B	481	LEU
1	B	516	LEU
1	B	525	LYS
1	B	551	LEU
1	B	553	LYS
1	C	481	LEU
1	C	511	THR
1	C	551	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (8) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	487	GLN
1	A	501	GLN
1	A	515	ASN
1	B	456	GLN
1	B	470	HIS
1	B	515	ASN
1	C	487	GLN
1	C	515	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 oligosaccharides in this entry.

### 5.6 Ligand geometry [i](#)

Of 4 ligands modelled in this entry, 4 are monoatomic - leaving 0 for Mogul analysis.

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.

No monomer is involved in short contacts.

### 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 [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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
1	A	98/107 (91%)	0.26	2 (2%) 65 60	17, 32, 53, 60	0
1	B	98/107 (91%)	0.04	0 100 100	17, 32, 54, 62	0
1	C	98/107 (91%)	0.25	3 (3%) 51 45	17, 32, 53, 60	0
All	All	294/321 (91%)	0.18	5 (1%) 69 64	17, 32, 54, 62	0

All (5) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	456	GLN	3.3
1	C	553	LYS	2.2
1	A	552	ILE	2.2
1	C	524	MET	2.1
1	C	516	LEU	2.0

### 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 oligosaccharides 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, 95<sup>th</sup> 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( $\text{\AA}^2$ )	Q<0.9
2	CL	A	1555	1/1	0.97	0.09	24,24,24,24	0
2	CL	A	1554	1/1	0.99	0.03	33,33,33,33	0
2	CL	A	1556	1/1	0.99	0.03	27,27,27,27	0
2	CL	C	1554	1/1	0.99	0.03	27,27,27,27	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.