



# Full wwPDB X-ray Structure Validation Report ⓘ

Mar 21, 2016 – 10:11 PM EDT

PDB ID : 5FTP  
Title : sulfur SAD phasing of Cdc23Nterm: data collection with a tailored X- ray  
beam size at 2.69 Å wavelength (4.6 keV)  
Authors : Cianci, M.; Groves, M.R.; Barford, D.; Schneider, T.R.  
Deposited on : 2016-01-14  
Resolution : 3.10 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  
<http://wwpdb.org/validation/2016/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  
Mogul : unknown  
Xtriage (Phenix) : 1.9-1692  
EDS : rb-20027107  
Percentile statistics : 20151230.v01 (using entries in the PDB archive December 30th 2015)  
Refmac : 5.8.0122  
CCP4 : 6.5.0  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : rb-20027107

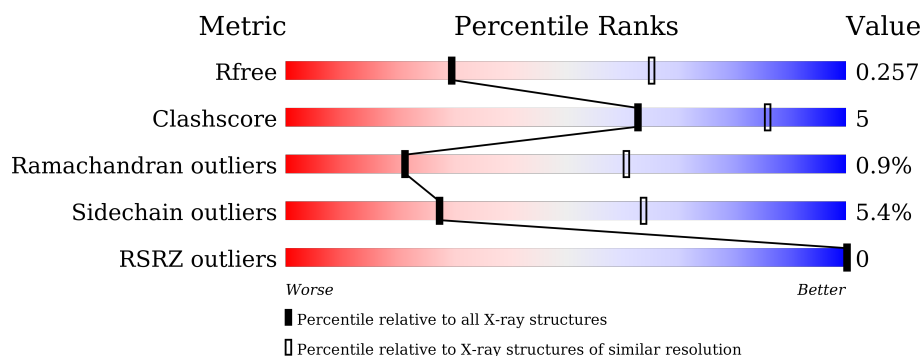
# 1 Overall quality at a glance ⓘ

The following experimental techniques were used to determine the structure:

## *X-RAY DIFFRACTION*

The reported resolution of this entry is 3.10 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))
$R_{free}$	91344	1114 (3.14-3.06)
Clashscore	102246	1222 (3.14-3.06)
Ramachandran outliers	100387	1174 (3.14-3.06)
Sidechain outliers	100360	1174 (3.14-3.06)
RSRZ outliers	91569	1119 (3.14-3.06)

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. 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	291	
1	B	291	

## 2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 3866 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 ANAPHASE-PROMOTING COMPLEX SUBUNIT 8.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	230	Total	C	N	O	S	0	0	0
			1871	1207	307	348	9			
1	B	242	Total	C	N	O	S	0	0	0
			1988	1280	328	371	9			

There are 18 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	18	MET	-	EXPRESSION TAG	UNP O94556
A	302	ALA	-	EXPRESSION TAG	UNP O94556
A	303	GLU	-	EXPRESSION TAG	UNP O94556
A	304	ASN	-	EXPRESSION TAG	UNP O94556
A	305	LEU	-	EXPRESSION TAG	UNP O94556
A	306	TYR	-	EXPRESSION TAG	UNP O94556
A	307	PHE	-	EXPRESSION TAG	UNP O94556
A	308	GLN	-	EXPRESSION TAG	UNP O94556
A	285	LEU	ASP	CONFLICT	UNP O94556
B	18	MET	-	EXPRESSION TAG	UNP O94556
B	302	ALA	-	EXPRESSION TAG	UNP O94556
B	303	GLU	-	EXPRESSION TAG	UNP O94556
B	304	ASN	-	EXPRESSION TAG	UNP O94556
B	305	LEU	-	EXPRESSION TAG	UNP O94556
B	306	TYR	-	EXPRESSION TAG	UNP O94556
B	307	PHE	-	EXPRESSION TAG	UNP O94556
B	308	GLN	-	EXPRESSION TAG	UNP O94556
B	285	LEU	ASP	CONFLICT	UNP O94556

- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	5	Total	O	0	0
			5	5		

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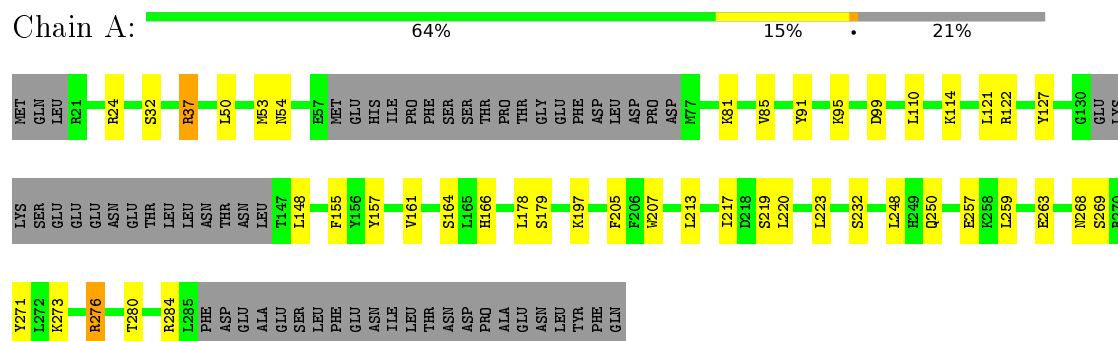
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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	B	2	Total	O	0	0
			2	2		

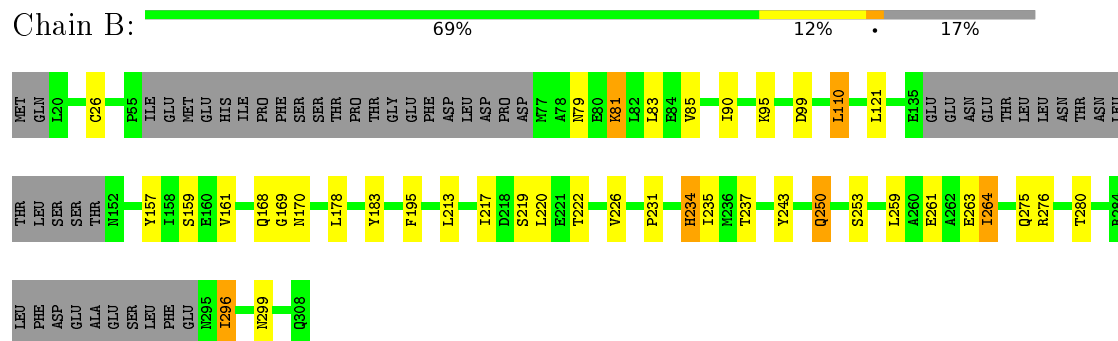
### 3 Residue-property plots

These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of errors displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. 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. A red dot above a residue indicates a poor fit to the electron density ( $RSRZ > 2$ ). 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.

#### • Molecule 1: ANAPHASE-PROMOTING COMPLEX SUBUNIT 8



#### • Molecule 1: ANAPHASE-PROMOTING COMPLEX SUBUNIT 8



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 43	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	61.25Å 61.25Å 151.56Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	61.25 – 3.10 61.25 – 3.10	Depositor EDS
% Data completeness (in resolution range)	99.7 (61.25-3.10) 99.7 (61.25-3.10)	Depositor EDS
$R_{merge}$	0.11	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.82 (at 3.13Å)	Xtriage
Refinement program	REFMAC 5.8.0135	Depositor
R, $R_{free}$	0.187 , 0.260 0.198 , 0.257	Depositor DCC
$R_{free}$ test set	510 reflections (5.30%)	DCC
Wilson B-factor (Å <sup>2</sup> )	62.5	Xtriage
Anisotropy	0.010	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.35 , 38.4	EDS
Estimated twinning fraction	0.069 for h,-k,-l	Xtriage
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.33$	Xtriage
Outliers	0 of 10125 reflections	Xtriage
$F_o, F_c$ correlation	0.93	EDS
Total number of atoms	3866	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	56.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.33% 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, 0.375 respectively for untwinned datasets, and 0.333, 0.2 for perfectly twinned datasets.

## 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	0.47	0/1909	0.75	4/2577 (0.2%)
1	B	0.49	0/2028	0.72	0/2734
All	All	0.48	0/3937	0.73	4/5311 (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	1
1	B	0	1
All	All	0	2

There are no bond length outliers.

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed( $^{\circ}$ )	Ideal( $^{\circ}$ )
1	A	276	ARG	NE-CZ-NH2	-5.81	117.40	120.30
1	A	37	ARG	CA-C-N	5.77	127.74	116.20
1	A	122	ARG	NE-CZ-NH1	5.63	123.11	120.30
1	A	37	ARG	N-CA-C	5.55	125.98	111.00

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	37	ARG	Peptide
1	B	234	HIS	Peptide

## 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	1871	0	1870	21	0
1	B	1988	0	1981	21	0
2	A	5	0	0	0	0
2	B	2	0	0	0	0
All	All	3866	0	3851	41	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 (41) 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:148:LEU:HD21	1:A:155:PHE:HE1	1.37	0.89
1:A:148:LEU:HD21	1:A:155:PHE:CE1	2.17	0.79
1:B:110:LEU:HD11	1:B:121:LEU:HD12	1.80	0.63
1:A:148:LEU:HD23	1:A:148:LEU:C	2.21	0.59
1:B:261:GLU:HA	1:B:264:ILE:CD1	2.32	0.59
1:B:168:GLN:O	1:B:170:ASN:N	2.40	0.55
1:A:81:LYS:O	1:A:85:VAL:HG23	2.10	0.52
1:A:213:LEU:O	1:A:217:ILE:HG13	2.11	0.51
1:B:261:GLU:O	1:B:264:ILE:HD13	2.10	0.51
1:B:157:TYR:O	1:B:161:VAL:HG23	2.11	0.51
1:B:81:LYS:O	1:B:85:VAL:HG23	2.10	0.51
1:A:273:LYS:HD2	1:A:273:LYS:N	2.26	0.50
1:B:220:LEU:HD13	1:B:250:GLN:HB3	1.94	0.49
1:A:157:TYR:O	1:A:161:VAL:HG23	2.13	0.48
1:A:127:TYR:CZ	1:A:148:LEU:HA	2.49	0.48
1:A:207:TRP:CZ2	1:A:271:TYR:OH	2.65	0.48
1:A:220:LEU:HD13	1:A:250:GLN:HB3	1.96	0.48
1:B:234:HIS:O	1:B:237:THR:N	2.45	0.48
1:A:166:HIS:NE2	1:A:179:SER:OG	2.36	0.47
1:A:259:LEU:O	1:A:263:GLU:HG3	2.14	0.47
1:B:213:LEU:O	1:B:217:ILE:HG12	2.14	0.47
1:A:205:PHE:CD1	1:B:26:CYS:HB3	2.50	0.46
1:B:183:TYR:CE2	1:B:195:PHE:CE2	3.04	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:220:LEU:HD13	1:A:250:GLN:CB	2.46	0.46
1:B:296:ILE:HA	1:B:299:ASN:HD22	1.81	0.46
1:B:296:ILE:HA	1:B:299:ASN:ND2	2.30	0.45
1:B:259:LEU:O	1:B:263:GLU:HG3	2.17	0.45
1:B:95:LYS:NZ	1:B:99:ASP:OD1	2.49	0.45
1:A:95:LYS:NZ	1:A:99:ASP:OD1	2.49	0.44
1:A:276:ARG:O	1:A:280:THR:HG23	2.18	0.44
1:B:261:GLU:O	1:B:264:ILE:CD1	2.67	0.43
1:A:223:LEU:HD22	1:A:248:LEU:HD12	2.02	0.42
1:A:50:LEU:O	1:A:53:MET:HG2	2.20	0.42
1:A:178:LEU:HA	1:A:178:LEU:HD12	1.94	0.41
1:A:269:SER:O	1:A:273:LYS:HD3	2.20	0.41
1:B:261:GLU:C	1:B:264:ILE:HD13	2.41	0.41
1:A:91:TYR:CZ	1:A:121:LEU:HD22	2.56	0.41
1:B:222:THR:O	1:B:226:VAL:HG23	2.20	0.41
1:B:220:LEU:HD13	1:B:250:GLN:CB	2.52	0.40
1:B:243:TYR:HA	1:B:275:GLN:HE22	1.86	0.40
1:B:276:ARG:O	1:B:280:THR:HG23	2.20	0.40

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	224/291 (77%)	207 (92%)	16 (7%)	1 (0%)	39	75
1	B	234/291 (80%)	216 (92%)	15 (6%)	3 (1%)	15	50
All	All	458/582 (79%)	423 (92%)	31 (7%)	4 (1%)	21	61

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	235	ILE
1	B	169	GLY
1	A	54	ASN
1	B	231	PRO

### 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	206/267 (77%)	195 (95%)	11 (5%)	28	64
1	B	219/267 (82%)	207 (94%)	12 (6%)	27	63
All	All	425/534 (80%)	402 (95%)	23 (5%)	27	64

All (23) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	24	ARG
1	A	32	SER
1	A	110	LEU
1	A	114	LYS
1	A	164	SER
1	A	197	LYS
1	A	219	SER
1	A	232	SER
1	A	257	GLU
1	A	268	ASN
1	A	284	ARG
1	B	79	ASN
1	B	81	LYS
1	B	83	LEU
1	B	90	ILE
1	B	110	LEU
1	B	159	SER
1	B	178	LEU
1	B	219	SER
1	B	250	GLN

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Mol	Chain	Res	Type
1	B	253	SER
1	B	264	ILE
1	B	296	ILE

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (6) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	229	GLN
1	A	275	GLN
1	B	79	ASN
1	B	275	GLN
1	B	299	ASN
1	B	308	GLN

### 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 [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, 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	230/291 (79%)	-0.21	0 100 100	31, 51, 78, 127	0
1	B	242/291 (83%)	-0.21	0 100 100	31, 56, 85, 113	0
All	All	472/582 (81%)	-0.21	0 100 100	31, 54, 83, 127	0

There are no RSRZ outliers to report.

### 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](#)

There are no ligands in this entry.

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

There are no such residues in this entry.