



# Full wwPDB X-ray Structure Validation Report

Sep 10, 2014 – 01:08 AM EDT

PDB ID : 4N4X  
Title : Crystal Structure of the MBP fused human SPLUNC1 (native form)  
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Deposited on : 2013-10-08  
Resolution : 2.50 Å(reported)

This is a full wwPDB 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/ValidationPDFNotes.html>

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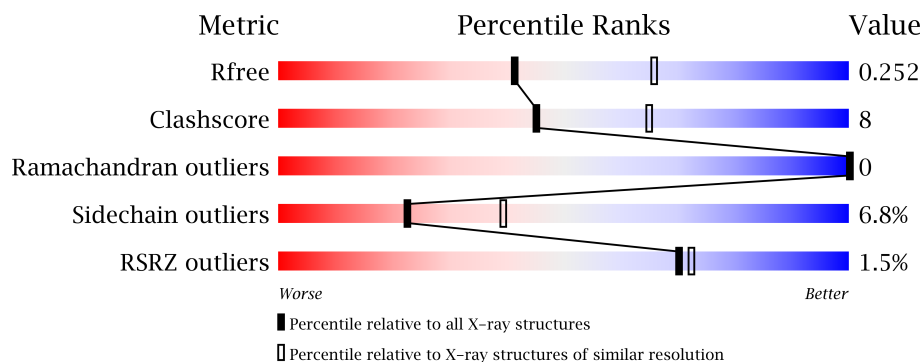
The following versions of software and data (see [references](#)) were used in the production of this report:

MolProbity : 4.02b-467  
Mogul : 1.16 November 2013  
Xtriage (Phenix) : dev-1439  
EDS : stable23489  
Percentile statistics : 21963  
Refmac : 5.8.0049  
CCP4 : 6.3.0 (Settle)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et. al. (1996)  
Validation Pipeline (wwPDB-VP) : stable23489

# 1 Overall quality at a glance

The reported resolution of this entry is 2.50 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))
$R_{free}$	66092	2784 (2.50-2.50)
Clashscore	79885	3562 (2.50-2.50)
Ramachandran outliers	78287	3480 (2.50-2.50)
Sidechain outliers	78261	3482 (2.50-2.50)
RSRZ outliers	66119	2785 (2.50-2.50)

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. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density.

Mol	Chain	Length	Quality of chain
1	A	584	

The following table lists non-polymeric compounds that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Geometry	Electron density
2	PEG	A	1301	-	X

## 2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 4140 atoms, of which 0 are hydrogen and 0 are deuterium.

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.

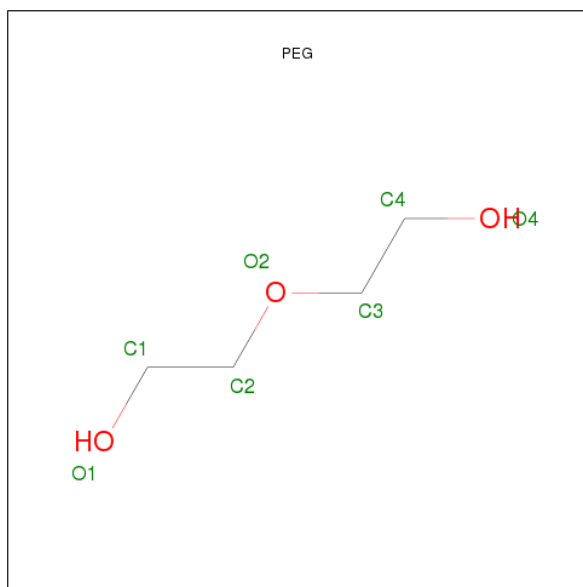
- Molecule 1 is a protein called Maltose-binding periplasmic/Palate lung and nasal epithelium clone fusion protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	535	Total	C	N	O	S	4	0	0
			4010	2595	651	755	9			

There are 9 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	362	ALA	-	LINKER	UNP P0AEX9
A	363	ALA	-	LINKER	UNP P0AEX9
A	364	ALA	-	LINKER	UNP P0AEX9
A	365	GLN	-	LINKER	UNP P0AEX9
A	366	THR	-	LINKER	UNP P0AEX9
A	367	ASN	-	LINKER	UNP P0AEX9
A	368	ALA	-	LINKER	UNP P0AEX9
A	369	ALA	-	LINKER	UNP P0AEX9
A	370	ALA	-	LINKER	UNP P0AEX9

- Molecule 2 is DI(HYDROXYETHYL)ETHER (three-letter code: PEG) (formula: C<sub>4</sub>H<sub>10</sub>O<sub>3</sub>).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	A	1	Total	C	O	0	0
			7	4	3		

- Molecule 3 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	1	Total	Mg	0	0
			1	1		

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	122	Total	O	0	0
			122	122		



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 32 2 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	119.09Å 119.09Å 98.54Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	45.69 – 2.50 45.69 – 2.50	Depositor EDS
% Data completeness (in resolution range)	98.5 (45.69-2.50) 99.6 (45.69-2.50)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	3.33 (at 2.51Å)	Xtriage
Refinement program	PHENIX (phenix.refine: 1.7.1_743)	Depositor
R, $R_{free}$	0.215 , 0.268 0.197 , 0.252	Depositor DCC
$R_{free}$ test set	1417 reflections (5.04%)	DCC
Wilson B-factor (Å <sup>2</sup> )	48.4	Xtriage
Anisotropy	0.303	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.31 , 36.8	EDS
Estimated twinning fraction	0.026 for -h,-k,l	Xtriage
L-test for twinning	$\langle  L  \rangle = 0.51$ , $\langle L^2 \rangle = 0.34$	Xtriage
Outliers	0 of 28189 reflections	Xtriage
$F_o, F_c$ correlation	0.95	EDS
Total number of atoms	4140	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	54.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.81% of the height of the origin peak. No significant pseudotranslation is detected.*

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

## 5 Model quality

### 5.1 Standard geometry

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

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	0/4091	0.61	1/5575 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	1073	LEU	CA-CB-CG	5.40	127.72	115.30

There are no chirality outliers.

There are no planarity outliers.

### 5.2 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 hydrogens added by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, and the number in parentheses is this value normalized per 1000 atoms of the molecule in the chain. The Symm-Clashes column gives symmetry related clashes, in the same way as for the Clashes column.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	4010	0	4000	67	0
2	A	7	0	10	1	0
3	A	1	0	0	0	0
4	A	122	0	0	0	0
All	All	4140	0	4010	67	0

Clashscore is defined as the number of clashes calculated for the entry per 1000 atoms (including hydrogens) of the entry. The overall clashscore for this entry is 8.

All (67) close contacts within the same asymmetric unit are listed below.

Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:A:1114:GLN:OE1	1:A:1138:LYS:NZ	2.01	0.93
1:A:1189:ILE:HG13	1:A:1208:THR:HB	1.57	0.85
1:A:1116:LEU:HB2	1:A:1134:PRO:HB2	1.58	0.85
1:A:1179:ASP:N	1:A:1179:ASP:OD1	2.15	0.79
1:A:68:GLY:HA3	1:A:332:ASN:O	1.91	0.71
1:A:89:LEU:HD23	1:A:107:PRO:HG2	1.74	0.70
1:A:1210:ILE:O	1:A:1214:VAL:HG12	1.93	0.68
1:A:1183:SER:HB3	1:A:1186:SER:HB3	1.74	0.68
1:A:1161:ALA:HB1	1:A:1177:LEU:HD11	1.76	0.67
1:A:1245:MET:HE3	1:A:1250:LEU:HB2	1.78	0.66
1:A:1073:LEU:C	1:A:1073:LEU:HD23	2.16	0.65
1:A:1123:SER:HB3	1:A:1128:ARG:HB2	1.79	0.64
1:A:314:ASP:OD1	1:A:316:ARG:HG2	1.98	0.64
1:A:1208:THR:O	1:A:1212:ASN:ND2	2.32	0.62
1:A:48:PRO:HG3	1:A:70:TYR:CE1	2.35	0.62
1:A:1204:LEU:HB2	1:A:1208:THR:CG2	2.31	0.61
1:A:288:GLU:HB2	2:A:1301:PEG:H22	1.84	0.60
1:A:43:LEU:HD13	1:A:60:ILE:CD1	2.31	0.60
1:A:97:VAL:HG21	1:A:107:PRO:HD3	1.85	0.58
1:A:130:GLU:O	1:A:133:PRO:HD2	2.05	0.57
1:A:4:GLU:HG3	1:A:271:PRO:HB2	1.87	0.57
1:A:178:ILE:H	1:A:178:ILE:HD13	1.70	0.55
1:A:1141:VAL:HB	1:A:1151:LEU:HB3	1.88	0.55
1:A:1204:LEU:HA	1:A:1206:SER:N	2.21	0.55
1:A:43:LEU:HD13	1:A:60:ILE:HD11	1.88	0.55
1:A:1224:CYS:N	1:A:1225:PRO:HD2	2.21	0.54
1:A:1055:LEU:HD23	1:A:1230:VAL:HG12	1.90	0.53
1:A:43:LEU:CD1	1:A:60:ILE:HD11	2.37	0.53
1:A:1204:LEU:HB2	1:A:1208:THR:HG22	1.91	0.52
1:A:1205:ASP:HA	1:A:1208:THR:HG23	1.92	0.51
1:A:48:PRO:HG3	1:A:70:TYR:HE1	1.76	0.51
1:A:129:TRP:HA	1:A:132:ILE:HD12	1.92	0.50
1:A:1138:LYS:N	1:A:1138:LYS:HD3	2.29	0.48
1:A:23:VAL:HG12	1:A:279:PHE:CE1	2.48	0.48
1:A:122:LEU:HD13	1:A:135:LEU:HD21	1.95	0.48
1:A:100:ASN:HA	1:A:175:LYS:HD2	1.94	0.48
1:A:196:VAL:HG12	1:A:200:LYS:HE2	1.95	0.48
1:A:1138:LYS:N	1:A:1138:LYS:CD	2.77	0.48
1:A:1204:LEU:HB2	1:A:1205:ASP:HA	1.96	0.48
1:A:1073:LEU:C	1:A:1073:LEU:CD2	2.82	0.47
1:A:122:LEU:CD1	1:A:135:LEU:HD21	2.44	0.47
1:A:148:MET:HB2	1:A:222:THR:HG21	1.97	0.47

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Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:A:78:GLU:CD	1:A:102:LYS:HE3	2.36	0.47
1:A:1162:GLU:HB3	1:A:1178:GLY:HA3	1.96	0.47
1:A:158:TRP:N	1:A:159:PRO:CD	2.77	0.47
1:A:1138:LYS:HA	1:A:1153:LEU:O	2.15	0.46
1:A:1067:ILE:O	1:A:1071:LEU:HD13	2.16	0.46
1:A:150:ASN:OD1	1:A:209:ASP:HA	2.16	0.46
1:A:1203:LEU:HD12	1:A:1204:LEU:O	2.15	0.45
1:A:184:ASP:HB2	1:A:365:GLN:HB2	1.98	0.45
1:A:246:VAL:HG22	1:A:322:GLU:CD	2.36	0.45
1:A:1169:LYS:N	1:A:1170:GLN:HA	2.30	0.45
1:A:1128:ARG:NE	1:A:1162:GLU:OE2	2.51	0.44
1:A:1181:THR:HA	1:A:1220:GLN:OE1	2.16	0.44
1:A:1139:LEU:O	1:A:1152:ARG:HA	2.18	0.44
1:A:228:GLY:HA3	1:A:230:TRP:CH2	2.53	0.44
1:A:109:ALA:HA	1:A:302:VAL:HA	1.99	0.44
1:A:229:PRO:HA	1:A:232:TRP:CE2	2.53	0.44
1:A:1072:PRO:O	1:A:1073:LEU:O	2.36	0.43
1:A:28:GLU:O	1:A:32:GLY:N	2.47	0.42
1:A:66:ARG:HD2	1:A:66:ARG:HA	1.87	0.42
1:A:18:ASN:O	1:A:21:ALA:HB3	2.20	0.42
1:A:1071:LEU:HA	1:A:1071:LEU:HD12	1.68	0.41
1:A:132:ILE:N	1:A:133:PRO:CD	2.84	0.41
1:A:1254:ILE:HG22	1:A:1255:LYS:O	2.21	0.41
1:A:228:GLY:HA3	1:A:230:TRP:CZ3	2.55	0.41
1:A:290:LEU:HD23	1:A:290:LEU:HA	1.88	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	527/584 (90%)	515 (98%)	12 (2%)	0	100	100

There are no Ramachandran outliers to report.

### 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	410/472 (87%)	382 (93%)	28 (7%)	22	39

All (28) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	6	LYS
1	A	46	LYS
1	A	135	LEU
1	A	170	LYS
1	A	178	ILE
1	A	202	LYS
1	A	239	LYS
1	A	316	ARG
1	A	1045	THR
1	A	1064	LEU
1	A	1071	LEU
1	A	1073	LEU
1	A	1107	ASP
1	A	1156	LYS
1	A	1166	VAL
1	A	1179	ASP
1	A	1181	THR
1	A	1183	SER
1	A	1187	LEU
1	A	1189	ILE
1	A	1203	LEU
1	A	1204	LEU
1	A	1208	THR
1	A	1211	LEU
1	A	1215	LEU
1	A	1220	GLN
1	A	1228	ASN
1	A	1256	VAL

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

### 5.3.3 RNA ⓘ

There are no RNA chains in this entry.

## 5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

There are no non-standard protein/DNA/RNA residues in this entry.

## 5.5 Carbohydrates ⓘ

There are no carbohydrates in this entry.

## 5.6 Ligand geometry ⓘ

Of 2 ligands modelled in this entry, 1 is monoatomic - leaving 1 for Mogul analysis.

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	$\# Z  > 2$
2	PEG	A	1301	-	6,6,6	0.57	0	5,5,5	1.26	1 (20%)

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
2	PEG	A	1301	-	-	0/4/4/4	0/0/0/0

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	1301	PEG	O2-C2-C1	2.05	120.15	110.56

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

## 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 ⓘ

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	535/584 (91%)	-0.18	8 (1%) 70 72	28, 53, 82, 111	5 (0%)

All (8) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	1256	VAL	5.7
1	A	1107	ASP	4.3
1	A	1151	LEU	3.7
1	A	1204	LEU	3.2
1	A	1072	PRO	2.9
1	A	1142	ASN	2.6
1	A	1141	VAL	2.4
1	A	1108	ILE	2.3

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

There are no non-standard protein/DNA/RNA residues in this entry.

### 6.3 Carbohydrates ⓘ

There are no carbohydrates in this entry.

### 6.4 Ligands ⓘ

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. LLDF column lists the quality of electron density of the group with respect to its neighbouring residues in protein, DNA or RNA chains. 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	RSR	LLDF	B-factors( $\text{\AA}^2$ )	Q<0.9
2	PEG	A	1301	7/7	0.19	8.51	49,54,59,66	0
3	MG	A	1302	1/1	0.07	-3.85	30,30,30,30	0

## 6.5 Other polymers ⓘ

There are no such residues in this entry.