



# Full wwPDB X-ray Structure Validation Report ⓘ

Feb 1, 2016 – 09:12 AM GMT

PDB ID : 3HM6  
Title : Crystal structure of the cytoplasmic domain of human plexin B1  
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Edwards, A.M.; Bountra, C.; Weigelt, J.; Bochkarev, A.; Park, H.; Structural  
Genomics Consortium (SGC)  
Deposited on : 2009-05-28  
Resolution : 2.40 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 : 1.7 (RC4), CSD as536be (2015)  
Xtriage (Phenix) : 1.9-1692  
EDS : rb-20026688  
Percentile statistics : 20151230.v01 (using entries in the PDB archive December 30th 2015)  
Refmac : 5.8.0135  
CCP4 : 6.5.0  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : trunk26865

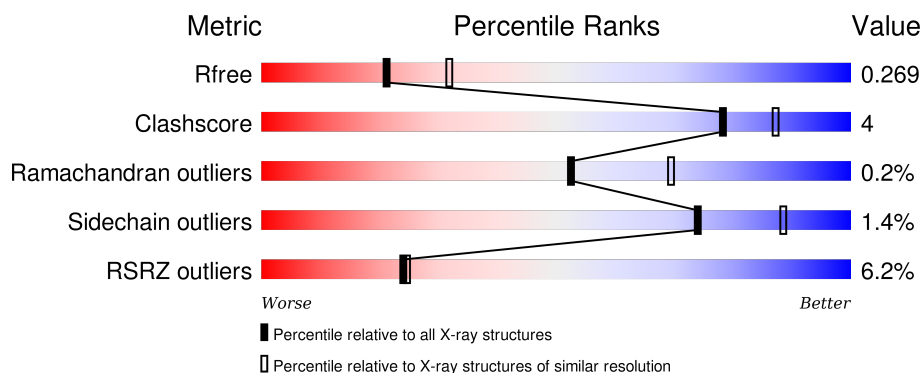
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

## *X-RAY DIFFRACTION*

The reported resolution of this entry is 2.40 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	2919 (2.40-2.40)
Clashscore	102246	3407 (2.40-2.40)
Ramachandran outliers	100387	3351 (2.40-2.40)
Sidechain outliers	100360	3352 (2.40-2.40)
RSRZ outliers	91569	2928 (2.40-2.40)

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	X	644	<div> <div>5%</div> <div>71%</div> <div>7%</div> <div>22%</div> </div>
2	C	27	<div> <div>100%</div> </div>

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
3	UNX	X	10	-	-	-	X
3	UNX	X	11	-	-	-	X
3	UNX	X	12	-	-	-	X
3	UNX	X	13	-	-	-	X
3	UNX	X	15	-	-	-	X
3	UNX	X	16	-	-	-	X
3	UNX	X	18	-	-	-	X
3	UNX	X	19	-	-	-	X
3	UNX	X	2	-	-	-	X
3	UNX	X	3	-	-	-	X
3	UNX	X	6	-	-	-	X

## 2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 4134 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 Plexin-B1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	X	503	Total	C	N	O	S	0	0	0
			3943	2543	663	724	13			

There are 20 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
X	1492	MET	-	EXPRESSION TAG	UNP O43157
X	1493	GLY	-	EXPRESSION TAG	UNP O43157
X	1494	SER	-	EXPRESSION TAG	UNP O43157
X	1495	SER	-	EXPRESSION TAG	UNP O43157
X	1496	HIS	-	EXPRESSION TAG	UNP O43157
X	1497	HIS	-	EXPRESSION TAG	UNP O43157
X	1498	HIS	-	EXPRESSION TAG	UNP O43157
X	1499	HIS	-	EXPRESSION TAG	UNP O43157
X	1500	HIS	-	EXPRESSION TAG	UNP O43157
X	1501	HIS	-	EXPRESSION TAG	UNP O43157
X	1502	SER	-	EXPRESSION TAG	UNP O43157
X	1503	SER	-	EXPRESSION TAG	UNP O43157
X	1504	GLY	-	EXPRESSION TAG	UNP O43157
X	1505	LEU	-	EXPRESSION TAG	UNP O43157
X	1506	VAL	-	EXPRESSION TAG	UNP O43157
X	1507	PRO	-	EXPRESSION TAG	UNP O43157
X	1508	ARG	-	EXPRESSION TAG	UNP O43157
X	1509	GLY	-	EXPRESSION TAG	UNP O43157
X	1510	SER	-	EXPRESSION TAG	UNP O43157
X	1625	THR	SER	ENGINEERED	UNP O43157

- Molecule 2 is a protein called Unknown peptide.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
2	C	27	Total	C	N	O	0	0	0
			135	81	27	27			

- Molecule 3 is UNKNOWN ATOM OR ION (three-letter code: UNX) (formula: X).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	X	19	Total	X	0	0
			19	19		

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	X	37	Total	O	0	0
			37	37		



- Molecule 1: Plexin-B1



There are no outlier residues recorded for this chain.

## 4 Data and refinement statistics

Property	Value	Source
Space group	P 31 2 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	74.35Å 74.35Å 214.40Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	28.08 – 2.40 27.66 – 2.40	Depositor EDS
% Data completeness (in resolution range)	99.8 (28.08-2.40) 99.8 (27.66-2.40)	Depositor EDS
$R_{merge}$	0.04	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	3.12 (at 2.42Å)	Xtriage
Refinement program	REFMAC 5.2.0019	Depositor
R, $R_{free}$	0.227 , 0.262 0.237 , 0.269	Depositor DCC
$R_{free}$ test set	1390 reflections (5.30%)	DCC
Wilson B-factor (Å <sup>2</sup> )	52.3	Xtriage
Anisotropy	0.024	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.31 , 91.1	EDS
Estimated twinning fraction	0.027 for -h,-k,l	Xtriage
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtriage
Outliers	0 of 27598 reflections	Xtriage
$F_o, F_c$ correlation	0.93	EDS
Total number of atoms	4134	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	57.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.82% 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 [i](#)

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

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

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	X	0.61	0/4025	0.64	0/5475

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	X	3943	0	3903	29	0
2	C	135	0	29	0	0
3	X	19	0	0	0	0
4	X	37	0	0	0	0
All	All	4134	0	3932	29	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 4.

All (29) 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:X:2055:ASP:O	1:X:2059:THR:HG23	1.71	0.89
1:X:1983:LEU:HD21	1:X:2017:MET:HA	1.59	0.84
1:X:1668:VAL:HG22	1:X:1967:ILE:HD11	1.76	0.68
1:X:1736:ASP:OD1	1:X:2033:ILE:HG13	1.93	0.68
1:X:2128:VAL:HG12	1:X:2128:VAL:O	1.99	0.62
1:X:1793:PRO:O	1:X:1796:GLN:N	2.36	0.58
1:X:1943:THR:HG23	1:X:2055:ASP:CG	2.25	0.57
1:X:1943:THR:HG22	1:X:1943:THR:O	2.05	0.57
1:X:1596:ARG:HB3	1:X:1597:PRO:HD3	1.90	0.54
1:X:1754:LEU:HD11	1:X:1764:ALA:CB	2.39	0.52
1:X:1835:THR:OG1	1:X:1837:GLN:CG	2.57	0.51
1:X:1981:LEU:HB3	1:X:1982:PRO:HD3	1.93	0.51
1:X:2124:ILE:O	1:X:2128:VAL:HG23	2.10	0.50
1:X:1949:LEU:HB3	1:X:2067:MET:HE1	1.94	0.49
1:X:1983:LEU:CD2	1:X:1987:ILE:HD12	2.43	0.49
1:X:1703:VAL:HG21	1:X:1986:TRP:CH2	2.48	0.48
1:X:1664:VAL:O	1:X:1668:VAL:HG23	2.14	0.47
1:X:1599:VAL:HG13	1:X:2128:VAL:HG13	1.97	0.45
1:X:2021:THR:HG22	1:X:2023:ALA:H	1.83	0.44
1:X:1626:GLN:HG3	1:X:2098:TYR:CD2	2.53	0.43
1:X:1754:LEU:HD11	1:X:1764:ALA:HB1	2.01	0.42
1:X:1842:PRO:HD2	1:X:1845:ALA:HB2	2.01	0.42
1:X:1591:VAL:HG11	1:X:1599:VAL:HG21	2.00	0.42
1:X:1978:THR:HG23	1:X:2020:CYS:HB3	2.00	0.42
1:X:1722:PRO:HD3	1:X:1746:TYR:CE2	2.55	0.41
1:X:1943:THR:O	1:X:1943:THR:CG2	2.67	0.41
1:X:1951:VAL:HG12	1:X:2056:ILE:HD13	2.03	0.41
1:X:1595:ARG:O	1:X:1599:VAL:HG23	2.21	0.40
1:X:1736:ASP:OD1	1:X:1736:ASP:N	2.55	0.40

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	X	491/644 (76%)	468 (95%)	22 (4%)	1 (0%)	52 69

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	X	1981	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	X	416/572 (73%)	410 (99%)	6 (1%)	74 88

All (6) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	X	1595	ARG
1	X	1612	SER
1	X	1702	SER
1	X	1705	GLU
1	X	1808	ARG
1	X	1968	SER

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 molecules 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 [i](#)

There are no carbohydrates in this entry.

## 5.6 Ligand geometry [i](#)

Of 19 ligands modelled in this entry, 19 are unknown - 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 [i](#)

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	X	503/644 (78%)	0.24	31 (6%) 24 25	28, 55, 76, 91	0
2	C	0/27	-	-	-	-
All	All	503/671 (74%)	0.24	31 (6%) 24 25	28, 55, 76, 91	0

All (31) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	X	1811	VAL	4.4
1	X	1766	GLY	4.0
1	X	2112	ALA	3.9
1	X	1889	PRO	3.7
1	X	1793	PRO	3.7
1	X	1826	VAL	3.3
1	X	1791	GLY	3.2
1	X	1767	VAL	3.0
1	X	1830	TRP	2.9
1	X	1795	THR	2.9
1	X	1742	GLU	2.8
1	X	1641	LEU	2.8
1	X	1593	GLU	2.7
1	X	1888	LYS	2.6
1	X	1881	ILE	2.5
1	X	1890	SER	2.5
1	X	2079	SER	2.5
1	X	1764	ALA	2.5
1	X	1592	PRO	2.4
1	X	1939	VAL	2.4
1	X	1918	TYR	2.2
1	X	1737	ASN	2.2
1	X	1884	TRP	2.2
1	X	1812	ALA	2.1
1	X	1771	VAL	2.1

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Mol	Chain	Res	Type	RSRZ
1	X	1642	THR	2.1
1	X	2109	ASP	2.1
1	X	2113	GLN	2.0
1	X	1694	CYS	2.0
1	X	1753	ALA	2.0
1	X	1639	SER	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 carbohydrates 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. 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	RSCC	RSR	LLDF	B-factors( $\text{\AA}^2$ )	Q<0.9
3	UNX	X	6	1/1	-0.15	5.40	147.43	2,2,2,2	1
3	UNX	X	19	1/1	-0.23	4.03	130.04	12,12,12,12	1
3	UNX	X	15	1/1	-0.63	2.80	109.02	2,2,2,2	1
3	UNX	X	13	1/1	-0.33	3.46	101.73	2,2,2,2	1
3	UNX	X	3	1/1	0.41	2.61	56.05	2,2,2,2	1
3	UNX	X	12	1/1	0.06	2.05	52.41	2,2,2,2	1
3	UNX	X	2	1/1	-0.11	2.19	48.95	2,2,2,2	1
3	UNX	X	16	1/1	-0.20	3.30	46.55	2,2,2,2	1
3	UNX	X	10	1/1	0.66	1.38	35.32	2,2,2,2	1
3	UNX	X	11	1/1	-0.53	1.95	33.52	2,2,2,2	1
3	UNX	X	18	1/1	0.32	1.14	33.42	2,2,2,2	1
3	UNX	X	5	1/1	0.20	2.98	-	2,2,2,2	1
3	UNX	X	17	1/1	-0.24	5.55	-	19,19,19,19	1
3	UNX	X	4	1/1	-0.28	2.06	-	2,2,2,2	1
3	UNX	X	7	1/1	0.36	2.35	-	2,2,2,2	1

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	LLDF	B-factors( $\text{\AA}^2$ )	Q<0.9
3	UNX	X	1	1/1	0.27	2.94	-	2,2,2,2	1
3	UNX	X	14	1/1	-0.28	5.53	-	2,2,2,2	1
3	UNX	X	9	1/1	-0.37	5.39	-	17,17,17,17	1
3	UNX	X	8	1/1	-0.10	2.99	-	2,2,2,2	1

## 6.5 Other polymers [i](#)

There are no such residues in this entry.