



wwPDB X-ray Structure Validation Summary Report ⓘ

Apr 18, 2026 – 11:45 PM UTC

PDB ID : 5IP4 / pdb_00005ip4
Title : X-RAY STRUCTURE OF THE C-TERMINAL DOMAIN OF HUMAN DOUBLECORTIN
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Deposited on : 2016-03-09
Resolution : 1.81 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

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>.

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

MolProbity : 4-5-2 with Phenix2.0
Xtrriage (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

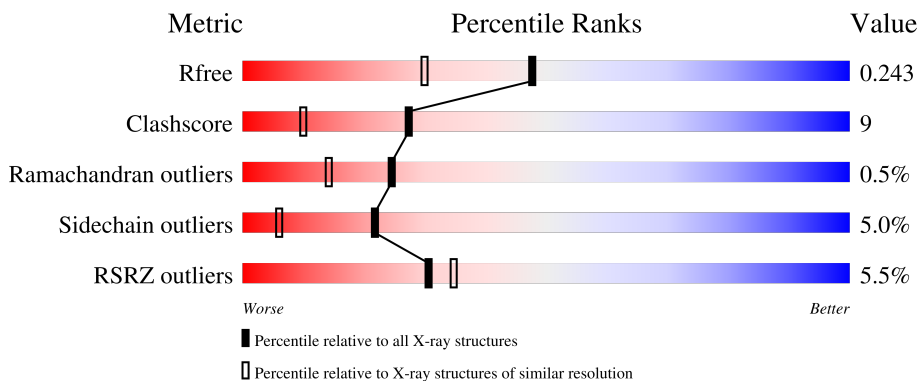
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.81 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	1112 (1.82-1.82)
Clashscore	190562	1148 (1.82-1.82)
Ramachandran outliers	187476	1140 (1.82-1.82)
Sidechain outliers	187428	1140 (1.82-1.82)
RSRZ outliers	180081	1112 (1.82-1.82)

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 ≥ 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	121	
1	B	121	
2	D	91	
2	E	91	

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 3373 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 XA4551 NANOBODY AGAINST C-DCX.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	109	841	524	152	162	3	0	0	0
1	B	110	847	527	153	164	3	0	0	0

- Molecule 2 is a protein called Neuronal migration protein doublecortin.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	D	80	631	407	109	113	2	0	0	0
2	E	84	667	432	114	119	2	0	0	0

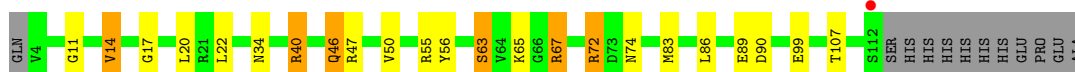
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	128	Total 128	O 128	0	0
3	B	124	Total 124	O 124	0	0
3	D	75	Total 75	O 75	0	0
3	E	60	Total 60	O 60	0	0

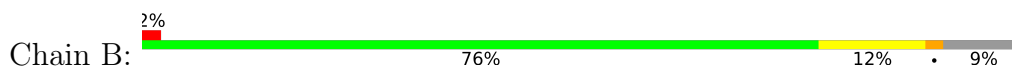
3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA, DNA and oligosaccharide 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 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.

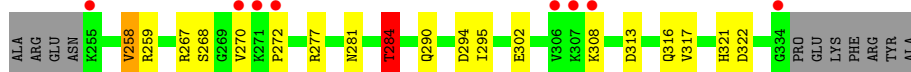
- Molecule 1: XA4551 NANOBODY AGAINST C-DCX



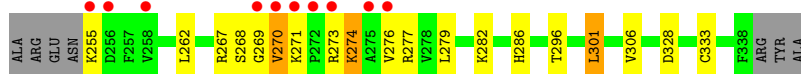
- Molecule 1: XA4551 NANOBODY AGAINST C-DCX



- Molecule 2: Neuronal migration protein doublecortin



- Molecule 2: Neuronal migration protein doublecortin



4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	89.84Å 86.19Å 73.27Å 90.00° 123.00° 90.00°	Depositor
Resolution (Å)	44.77 – 1.81 44.77 – 1.81	Depositor EDS
% Data completeness (in resolution range)	96.0 (44.77-1.81) 95.9 (44.77-1.81)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.07	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.46 (at 1.81Å)	Xtrriage
Refinement program	REFMAC 5.6.0112	Depositor
R, R_{free}	0.194 , 0.246 0.193 , 0.243	Depositor DCC
R_{free} test set	2063 reflections (4.83%)	wwPDB-VP
Wilson B-factor (Å ²)	26.0	Xtrriage
Anisotropy	0.123	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 29.2	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	3373	wwPDB-VP
Average B, all atoms (Å ²)	31.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.00% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical 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](#)

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	1.36	1/858 (0.1%)	1.49	12/1164 (1.0%)
1	B	1.24	2/864 (0.2%)	1.21	3/1172 (0.3%)
2	D	1.17	1/640 (0.2%)	1.18	1/861 (0.1%)
2	E	1.21	2/678 (0.3%)	1.22	2/912 (0.2%)
All	All	1.25	6/3040 (0.2%)	1.29	18/4109 (0.4%)

The worst 5 of 6 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	67	ARG	CD-NE	-8.22	1.34	1.46
1	B	83	MET	SD-CE	-6.07	1.64	1.79
2	E	279	LEU	CA-C	-5.60	1.46	1.52
1	B	35	HIS	ND1-CE1	5.53	1.38	1.32
2	D	321	HIS	CG-CD2	5.52	1.42	1.35

The worst 5 of 18 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	72	ARG	NE-CZ-NH2	-11.90	108.49	119.20
1	A	67	ARG	NE-CZ-NH2	-10.32	109.91	119.20
1	A	72	ARG	NE-CZ-NH1	8.50	130.00	121.50
1	B	40	ARG	CB-CG-CD	7.89	129.46	111.30
1	A	40	ARG	NE-CZ-NH2	-7.38	112.56	119.20

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	841	0	803	17	0
1	B	847	0	808	12	0
2	D	631	0	668	20	0
2	E	667	0	703	8	0
3	A	128	0	0	6	0
3	B	124	0	0	7	0
3	D	75	0	0	3	0
3	E	60	0	0	2	0
All	All	3373	0	2982	54	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 9.

The worst 5 of 54 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)
3:B:298:HOH:O	2:D:290:GLN:HG2	1.58	1.03
1:B:65:LYS:CE	3:B:218:HOH:O	2.22	0.86
1:B:65:LYS:HE2	3:B:218:HOH:O	1.76	0.86
2:D:302:GLU:HG3	3:D:459:HOH:O	1.76	0.85
1:B:40:ARG:HD3	3:B:304:HOH:O	1.78	0.83

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	107/121 (88%)	103 (96%)	4 (4%)	0	100	100
1	B	108/121 (89%)	105 (97%)	3 (3%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
2	D	78/91 (86%)	75 (96%)	3 (4%)	0	100	100
2	E	82/91 (90%)	77 (94%)	3 (4%)	2 (2%)	4	0
All	All	375/424 (88%)	360 (96%)	13 (4%)	2 (0%)	24	14

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	E	270	VAL
2	E	274	LYS

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	86/97 (89%)	83 (96%)	3 (4%)	32	13
1	B	87/97 (90%)	83 (95%)	4 (5%)	24	8
2	D	71/80 (89%)	67 (94%)	4 (6%)	19	4
2	E	75/80 (94%)	70 (93%)	5 (7%)	15	3
All	All	319/354 (90%)	303 (95%)	16 (5%)	22	6

5 of 16 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	E	271	LYS
2	E	268	SER
2	D	268	SER
2	E	267	ARG
2	D	258	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 9 such sidechains are listed below:

Mol	Chain	Res	Type
2	D	290	GLN
2	D	316	GLN
1	B	29	ASN
1	B	46	GLN
1	B	59	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](#)

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, 95th 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 ²)	Q<0.9
1	A	109/121 (90%)	-0.11	1 (0%) 81 85	16, 24, 43, 61	0
1	B	110/121 (90%)	-0.16	2 (1%) 67 73	16, 24, 42, 59	0
2	D	80/91 (87%)	0.52	8 (10%) 12 14	22, 33, 69, 102	0
2	E	84/91 (92%)	0.39	10 (11%) 9 9	19, 31, 60, 83	0
All	All	383/424 (90%)	0.11	21 (5%) 30 35	16, 27, 56, 102	0

The worst 5 of 21 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	D	272	PRO	4.8
1	B	56	TYR	4.1
2	E	275	ALA	3.9
2	E	272	PRO	3.7
2	D	270	VAL	3.6

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](#)

There are no ligands in this entry.

6.5 Other polymers [i](#)

There are no such residues in this entry.