



# Full wwPDB X-ray Structure Validation Report ⓘ

Feb 20, 2024 – 12:19 pm GMT

PDB ID : 8CKM  
Title : Semaphorin-5A TSR 3-4 domains  
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Deposited on : 2023-02-15  
Resolution : 2.72 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 : 4.02b-467  
Xtriage (Phenix) : 1.13  
EDS : 2.36  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
Refmac : 5.8.0158  
CCP4 : 7.0.044 (Gargrove)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.36

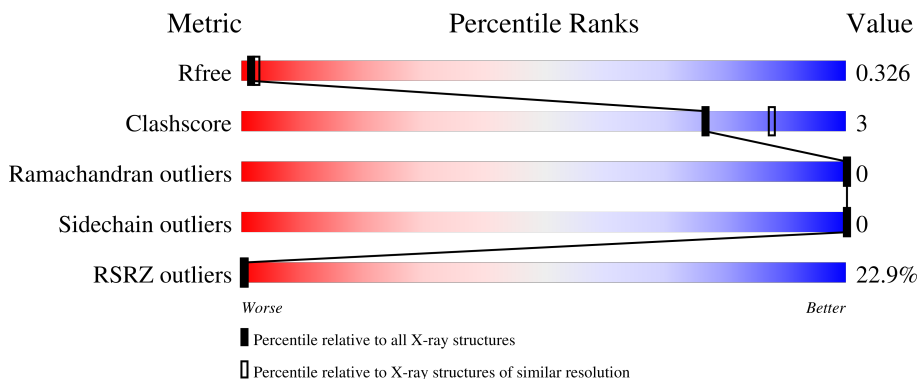
# 1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.72 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))
$R_{free}$	130704	3359 (2.74-2.70)
Clashscore	141614	3686 (2.74-2.70)
Ramachandran outliers	138981	3622 (2.74-2.70)
Sidechain outliers	138945	3623 (2.74-2.70)
RSRZ outliers	127900	3276 (2.74-2.70)

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	125	
1	B	125	

## 2 Entry composition i

There is only 1 type of molecule in this entry. The entry contains 1571 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 Semaphorin-5A.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	93	724	447	136	131	10	0	0	0
1	B	112	847	528	152	156	11	0	0	0

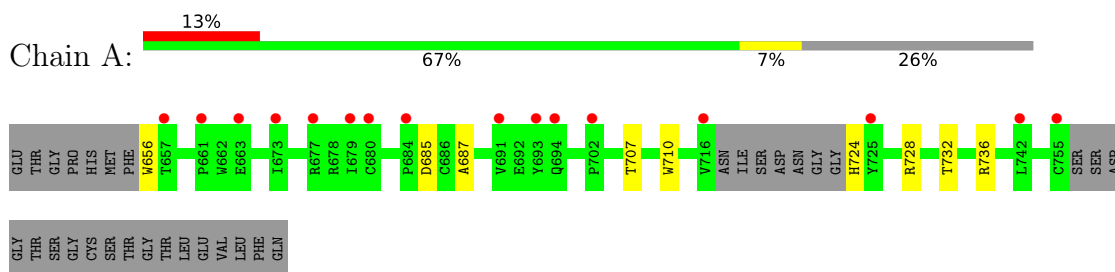
There are 20 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	649	GLU	-	expression tag	UNP Q13591
A	650	THR	-	expression tag	UNP Q13591
A	651	GLY	-	expression tag	UNP Q13591
A	766	GLY	ASP	conflict	UNP Q13591
A	767	THR	GLY	conflict	UNP Q13591
A	769	GLU	-	expression tag	UNP Q13591
A	770	VAL	-	expression tag	UNP Q13591
A	771	LEU	-	expression tag	UNP Q13591
A	772	PHE	-	expression tag	UNP Q13591
A	773	GLN	-	expression tag	UNP Q13591
B	649	GLU	-	expression tag	UNP Q13591
B	650	THR	-	expression tag	UNP Q13591
B	651	GLY	-	expression tag	UNP Q13591
B	766	GLY	ASP	conflict	UNP Q13591
B	767	THR	GLY	conflict	UNP Q13591
B	769	GLU	-	expression tag	UNP Q13591
B	770	VAL	-	expression tag	UNP Q13591
B	771	LEU	-	expression tag	UNP Q13591
B	772	PHE	-	expression tag	UNP Q13591
B	773	GLN	-	expression tag	UNP Q13591

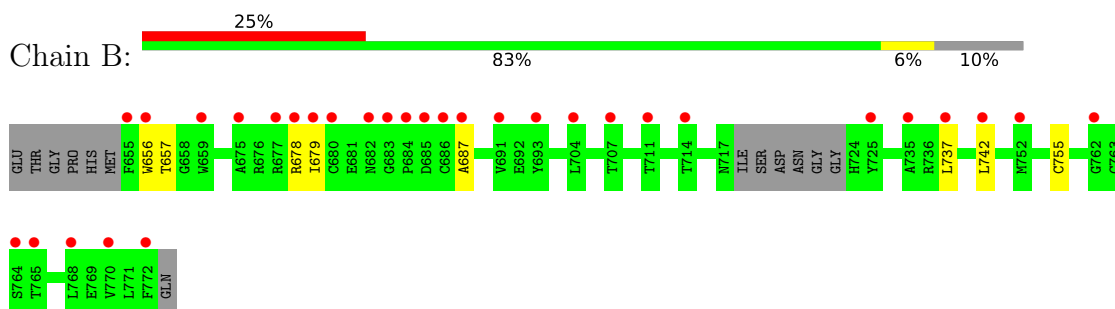
### 3 Residue-property plots [i](#)

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: Semaphorin-5A



- Molecule 1: Semaphorin-5A



## 4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	104.11Å 27.65Å 92.24Å 90.00° 99.10° 90.00°	Depositor
Resolution (Å)	51.40 – 2.72 51.40 – 2.72	Depositor EDS
% Data completeness (in resolution range)	98.1 (51.40-2.72) 98.1 (51.40-2.72)	Depositor EDS
$R_{merge}$	0.11	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.02 (at 2.73Å)	Xtrriage
Refinement program	PHENIX 1.19rc5_4047	Depositor
R, $R_{free}$	0.288 , 0.331 0.285 , 0.326	Depositor DCC
$R_{free}$ test set	334 reflections (4.64%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	99.2	Xtrriage
Anisotropy	0.455	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.32 , 101.3	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.48$ , $\langle L^2 \rangle = 0.31$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.92	EDS
Total number of atoms	1571	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	146.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 9.08% 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](#)

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	0.25	0/745	0.52	0/1016
1	B	0.27	0/870	0.52	0/1187
All	All	0.26	0/1615	0.52	0/2203

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	724	0	652	6	0
1	B	847	0	762	6	0
All	All	1571	0	1414	9	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 3.

All (9) 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:B:657:THR:HG22	1:B:679:ILE:H	1.57	0.70
1:A:656:TRP:NE1	1:A:687:ALA:O	2.31	0.61

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:707:THR:HG22	1:A:732:THR:HG22	1.83	0.59
1:A:736:ARG:HD2	1:B:742:LEU:HD22	1.85	0.58
1:B:656:TRP:HB3	1:B:678:ARG:HD2	1.93	0.51
1:A:724:HIS:HB3	1:B:755:CYS:HB2	1.95	0.48
1:A:710:TRP:HB3	1:A:728:ARG:HD2	1.94	0.48
1:B:737:LEU:HD13	1:B:742:LEU:HB2	1.96	0.46
1:A:685:ASP:HB3	1:B:687:ALA:HB1	1.99	0.45

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	89/125 (71%)	86 (97%)	3 (3%)	0	100	100
1	B	108/125 (86%)	102 (94%)	6 (6%)	0	100	100
All	All	197/250 (79%)	188 (95%)	9 (5%)	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	74/106 (70%)	74 (100%)	0	100	100

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	B	86/106 (81%)	86 (100%)	0	100	100
All	All	160/212 (76%)	160 (100%)	0	100	100

There are no protein residues with a non-rotameric sidechain to report.

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

### 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 monosaccharides 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

### 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	93/125 (74%)	1.25	16 (17%) <b>1</b> <b>1</b>	88, 157, 197, 223	0
1	B	112/125 (89%)	1.54	31 (27%) <b>0</b> <b>0</b>	95, 146, 221, 273	0
All	All	205/250 (82%)	1.41	47 (22%) <b>0</b> <b>0</b>	88, 147, 214, 273	0

All (47) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	685	ASP	9.2
1	B	683	GLY	8.1
1	B	693	TYR	7.4
1	B	687	ALA	6.9
1	A	693	TYR	6.8
1	B	765	THR	6.3
1	B	675	ALA	6.1
1	B	691	VAL	5.0
1	A	657	THR	5.0
1	B	684	PRO	4.9
1	A	679	ILE	4.8
1	B	680	CYS	4.3
1	B	682	ASN	4.1
1	B	737	LEU	4.0
1	A	684	PRO	4.0
1	A	677	ARG	3.9
1	B	762	GLY	3.9
1	A	716	VAL	3.8
1	B	686	CYS	3.8
1	A	725	TYR	3.7
1	B	677	ARG	3.6
1	B	764	SER	3.6
1	B	768	LEU	3.4
1	A	663	GLU	3.4

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Mol	Chain	Res	Type	RSRZ
1	A	661	PRO	3.2
1	A	673	ILE	3.1
1	B	742	LEU	3.1
1	B	659	TRP	3.0
1	B	770	VAL	3.0
1	B	678	ARG	3.0
1	B	679	ILE	3.0
1	B	656	TRP	2.9
1	B	735	ALA	2.6
1	B	752	MET	2.5
1	A	755	CYS	2.5
1	A	691	VAL	2.4
1	B	725	TYR	2.4
1	B	772	PHE	2.4
1	A	702	PRO	2.4
1	A	680	CYS	2.3
1	A	694	GLN	2.3
1	A	742	LEU	2.2
1	B	707	THR	2.2
1	B	711	THR	2.1
1	B	714	THR	2.1
1	B	704	LEU	2.1
1	B	655	PHE	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 monosaccharides 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.