



## wwPDB EM Validation Summary Report ⓘ

Jan 18, 2026 – 12:47 AM JST

PDB ID : 9KMQ / pdb\_00009kmq  
EMDB ID : EMD-62441  
Title : CryoEM structure of osPHT1-11 at pH 8.0  
Authors : Du, Z.M.; Guan, Z.Y.; Liu, Z.  
Deposited on : 2024-11-17  
Resolution : 3.30 Å(reported)

This is a wwPDB EM Validation Summary 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/EMValidationReportHelp>

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:

EMDB validation analysis : **FAILED**  
MolProbity : 4-5-2 with Phenix2.0  
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)  
EM percentile statistics : **NOT EXECUTED**  
MapQ : **FAILED**  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.47

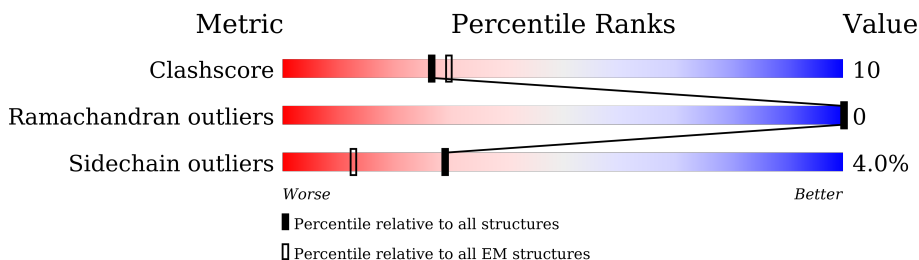
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*ELECTRON MICROSCOPY*

The reported resolution of this entry is 3.30 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)	EM structures (#Entries)
Clashscore	210492	15764
Ramachandran outliers	207382	16835
Sidechain outliers	206894	16415

The table below summarises the geometric issues observed across the polymeric chains and their fit to the map. The red, orange, yellow and green segments of the 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  $\leq 5\%$ .

Mol	Chain	Length	Quality of chain
1	A	584	
1	B	584	

## 2 Entry composition

There is only 1 type of molecule in this entry. The entry contains 6676 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, 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 Inorganic phosphate transporter 1-11.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	B	430	Total	C	N	O	S	0	0
			3331	2205	534	564	28		
1	A	432	Total	C	N	O	S	0	0
			3345	2214	536	567	28		

There are 58 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	-28	MET	-	initiating methionine	UNP Q94DB8
B	-27	ASP	-	expression tag	UNP Q94DB8
B	-26	TYR	-	expression tag	UNP Q94DB8
B	-25	LYS	-	expression tag	UNP Q94DB8
B	-24	ASP	-	expression tag	UNP Q94DB8
B	-23	ASP	-	expression tag	UNP Q94DB8
B	-22	ASP	-	expression tag	UNP Q94DB8
B	-21	ASP	-	expression tag	UNP Q94DB8
B	-20	LYS	-	expression tag	UNP Q94DB8
B	-19	GLY	-	expression tag	UNP Q94DB8
B	-18	ASP	-	expression tag	UNP Q94DB8
B	-17	TYR	-	expression tag	UNP Q94DB8
B	-16	LYS	-	expression tag	UNP Q94DB8
B	-15	ASP	-	expression tag	UNP Q94DB8
B	-14	ASP	-	expression tag	UNP Q94DB8
B	-13	ASP	-	expression tag	UNP Q94DB8
B	-12	ASP	-	expression tag	UNP Q94DB8
B	-11	LYS	-	expression tag	UNP Q94DB8
B	-10	ILE	-	expression tag	UNP Q94DB8
B	-9	ASP	-	expression tag	UNP Q94DB8
B	-8	TYR	-	expression tag	UNP Q94DB8
B	-7	LYS	-	expression tag	UNP Q94DB8
B	-6	ASP	-	expression tag	UNP Q94DB8
B	-5	ASP	-	expression tag	UNP Q94DB8
B	-4	ASP	-	expression tag	UNP Q94DB8
B	-3	ASP	-	expression tag	UNP Q94DB8

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Chain	Residue	Modelled	Actual	Comment	Reference
B	-2	LYS	-	expression tag	UNP Q94DB8
B	-1	GLY	-	expression tag	UNP Q94DB8
B	0	SER	-	expression tag	UNP Q94DB8
A	-28	MET	-	initiating methionine	UNP Q94DB8
A	-27	ASP	-	expression tag	UNP Q94DB8
A	-26	TYR	-	expression tag	UNP Q94DB8
A	-25	LYS	-	expression tag	UNP Q94DB8
A	-24	ASP	-	expression tag	UNP Q94DB8
A	-23	ASP	-	expression tag	UNP Q94DB8
A	-22	ASP	-	expression tag	UNP Q94DB8
A	-21	ASP	-	expression tag	UNP Q94DB8
A	-20	LYS	-	expression tag	UNP Q94DB8
A	-19	GLY	-	expression tag	UNP Q94DB8
A	-18	ASP	-	expression tag	UNP Q94DB8
A	-17	TYR	-	expression tag	UNP Q94DB8
A	-16	LYS	-	expression tag	UNP Q94DB8
A	-15	ASP	-	expression tag	UNP Q94DB8
A	-14	ASP	-	expression tag	UNP Q94DB8
A	-13	ASP	-	expression tag	UNP Q94DB8
A	-12	ASP	-	expression tag	UNP Q94DB8
A	-11	LYS	-	expression tag	UNP Q94DB8
A	-10	ILE	-	expression tag	UNP Q94DB8
A	-9	ASP	-	expression tag	UNP Q94DB8
A	-8	TYR	-	expression tag	UNP Q94DB8
A	-7	LYS	-	expression tag	UNP Q94DB8
A	-6	ASP	-	expression tag	UNP Q94DB8
A	-5	ASP	-	expression tag	UNP Q94DB8
A	-4	ASP	-	expression tag	UNP Q94DB8
A	-3	ASP	-	expression tag	UNP Q94DB8
A	-2	LYS	-	expression tag	UNP Q94DB8
A	-1	GLY	-	expression tag	UNP Q94DB8
A	0	SER	-	expression tag	UNP Q94DB8



K403	T404	H405	L408	F409	G410	L411	L412	A420	G423	P424	T428	L431	K453	I457	V458	A459	L466	T467	K477	L481	L482	T485	G489	F490	T493	V496	T499	MET	GLY	ARG	SER	LEU	GLU	GLU	ILE	SER	GLY	GLU	ASP	GLY	ASN	THR	GLY	ALA
GLY	GLY	GLY	ALA	PRO	ALA	ALA	ALA	ASN	ALA	GLY	VAL	GLY	VAL	VAL	ALA	SER	ASP	VAL	SER	ARG	ASP	GLU	LYS	PHE	PRO	ALA	SER	SER	THR	GLU	TRP	GLN	THR	SER	SER	MET	HIS	ALA						

## 4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, C1	Depositor
Number of particles used	346493	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	NONE	Depositor
Microscope	TFS KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ( $e^-/\text{\AA}^2$ )	50	Depositor
Minimum defocus (nm)	1200	Depositor
Maximum defocus (nm)	2000	Depositor
Magnification	Not provided	
Image detector	GATAN K3 BIOQUANTUM (6k x 4k)	Depositor

## 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	0.13	0/3431	0.35	0/4636
1	B	0.13	0/3417	0.37	0/4617
All	All	0.13	0/6848	0.36	0/9253

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

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	3345	0	3415	63	0
1	B	3331	0	3399	69	0
All	All	6676	0	6814	132	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 10.

The worst 5 of 132 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:331:MET:HE1	1:A:403:LYS:HA	1.55	0.87
1:B:160:GLU:HG2	1:B:161:TYR:H	1.45	0.81

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:388:MET:HE2	1:B:420:ALA:HA	1.69	0.74
1:B:371:LEU:HD12	1:B:375:MET:HG3	1.72	0.70
1:B:153:LEU:HG	1:B:158:MET:HE1	1.73	0.70

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 PDB entries followed by that with respect to all EM entries.

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	428/584 (73%)	400 (94%)	28 (6%)	0	100	100
1	B	426/584 (73%)	403 (95%)	23 (5%)	0	100	100
All	All	854/1168 (73%)	803 (94%)	51 (6%)	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 PDB entries followed by that with respect to all EM entries.

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	347/461 (75%)	334 (96%)	13 (4%)	29	56
1	B	345/461 (75%)	330 (96%)	15 (4%)	25	53
All	All	692/922 (75%)	664 (96%)	28 (4%)	29	55

5 of 28 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	495	LEU
1	A	496	VAL
1	A	127	SER
1	A	428	THR
1	A	124	SER

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 6 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	341	ASN
1	A	22	GLN
1	A	405	HIS
1	B	214	GLN
1	B	77	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.