



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 06:35 PM UTC

PDB ID : 4BXT / pdb_00004bxt
Title : Crystal structure of the human metapneumovirus phosphoprotein tetramerization domain
Authors : Leyrat, C.; Renner, M.; Harlos, K.; Grimes, J.M.
Deposited on : 2013-07-15
Resolution : 3.13 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

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

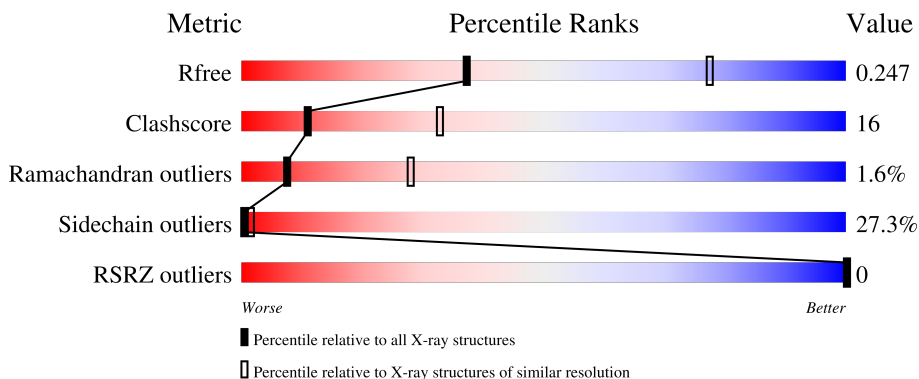
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 3.13 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	2351 (3.18-3.10)
Clashscore	190562	2452 (3.18-3.10)
Ramachandran outliers	187476	2324 (3.18-3.10)
Sidechain outliers	187428	2324 (3.18-3.10)
RSRZ outliers	180081	2351 (3.18-3.10)

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	80	19% 11% 70%
1	B	80	15% 10% 6% 69%
1	C	80	12% 12% 6% 69%
1	D	80	18% 12% . 68%
1	E	80	19% 8% . . 69%

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Mol	Chain	Length	Quality of chain
1	F	80	 15% 14% 69%
1	G	80	 15% 15% 68%
1	H	80	 8% 18% 71%

2 Entry composition

There is only 1 type of molecule in this entry. The entry contains 1560 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 PHOSPHOPROTEIN P.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	24	Total 189	C 121	N 31	O 36	S 1	0	0	0
1	B	25	Total 197	C 125	N 33	O 38	S 1	0	0	0
1	C	25	Total 195	C 124	N 32	O 38	S 1	0	0	0
1	D	26	Total 203	C 128	N 34	O 40	S 1	0	0	0
1	E	25	Total 197	C 125	N 33	O 38	S 1	0	0	0
1	F	25	Total 197	C 125	N 33	O 38	S 1	0	0	0
1	G	26	Total 201	C 127	N 33	O 40	S 1	0	0	0
1	H	23	Total 181	C 115	N 30	O 35	S 1	0	0	0

4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	66.91Å 48.52Å 64.45Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	46.42 – 3.13 46.42 – 3.13	Depositor EDS
% Data completeness (in resolution range)	89.6 (46.42-3.13) 89.6 (46.42-3.13)	Depositor EDS
R_{merge}	0.35	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.71 (at 3.12Å)	Xtrriage
Refinement program	BUSTER 2.11.2	Depositor
R, R_{free}	0.235 , 0.252 0.239 , 0.247	Depositor DCC
R_{free} test set	153 reflections (4.28%)	wwPDB-VP
Wilson B-factor (Å ²)	57.8	Xtrriage
Anisotropy	0.768	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 59.7	EDS
L-test for twinning ²	$\langle L \rangle = 0.46$, $\langle L^2 \rangle = 0.29$	Xtrriage
Estimated twinning fraction	0.062 for l,-k,h	Xtrriage
F_o, F_c correlation	0.91	EDS
Total number of atoms	1560	wwPDB-VP
Average B, all atoms (Å ²)	53.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 9.17% 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	0.76	0/188	1.62	0/250
1	B	0.83	0/196	1.64	1/261 (0.4%)
1	C	0.86	0/194	1.68	0/258
1	D	0.78	0/202	1.68	1/269 (0.4%)
1	E	0.78	0/196	1.59	2/261 (0.8%)
1	F	0.76	0/196	1.62	0/261
1	G	1.14	0/200	1.60	0/266
1	H	0.78	0/180	1.63	0/239
All	All	0.85	0/1552	1.63	4/2065 (0.2%)

There are no bond length outliers.

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	189	LEU	CD1-CG-CD2	-5.89	97.84	110.80
1	E	171	SER	CA-C-N	5.41	127.57	120.60
1	E	171	SER	C-N-CA	5.41	127.57	120.60
1	D	193	LEU	N-CA-C	-5.30	104.34	111.54

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	189	0	211	3	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	B	197	0	217	9	0
1	C	195	0	216	9	2
1	D	203	0	222	5	0
1	E	197	0	217	10	0
1	F	197	0	217	7	0
1	G	201	0	221	13	0
1	H	181	0	200	16	2
All	All	1560	0	1721	54	2

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 16.

All (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)
1:F:178:SER:OG	1:G:180:GLU:OE2	1.88	0.89
1:H:176:LEU:O	1:H:180:GLU:HG3	1.72	0.88
1:B:191:ARG:NH1	1:F:181:GLU:OE2	2.12	0.83
1:C:176:LEU:O	1:C:180:GLU:HG2	1.84	0.77
1:B:185:MET:O	1:B:189:LEU:HD12	1.86	0.76
1:G:170:LEU:H	1:G:170:LEU:HD12	1.55	0.70
1:H:191:ARG:N	1:H:191:ARG:HD2	2.10	0.66
1:G:179:ILE:HG23	1:H:183:LEU:HD11	1.77	0.66
1:C:179:ILE:O	1:C:183:LEU:HD23	1.96	0.65
1:B:185:MET:O	1:B:189:LEU:CD1	2.45	0.64
1:A:175:ARG:NH1	1:B:180:GLU:OE1	2.32	0.63
1:D:175:ARG:O	1:D:179:ILE:HG23	2.00	0.62
1:E:172:ILE:HG22	1:F:176:LEU:HD11	1.83	0.61
1:H:175:ARG:HG2	1:H:175:ARG:HH11	1.65	0.59
1:D:171:SER:HB2	1:D:173:GLU:OE1	2.02	0.59
1:G:176:LEU:HD21	1:H:176:LEU:HD21	1.84	0.59
1:G:170:LEU:HD13	1:G:175:ARG:HG3	1.84	0.57
1:B:172:ILE:HA	1:B:175:ARG:HG3	1.87	0.56
1:G:179:ILE:HG23	1:H:183:LEU:CD1	2.36	0.55
1:C:176:LEU:O	1:C:180:GLU:CG	2.55	0.55
1:A:176:LEU:O	1:A:180:GLU:HG3	2.07	0.54
1:B:191:ARG:O	1:B:194:ASN:HB2	2.09	0.53
1:C:169:SER:O	1:C:170:LEU:HB2	2.09	0.53
1:E:170:LEU:O	1:E:171:SER:HB3	2.10	0.52
1:E:187:LEU:HD21	1:H:185:MET:HG2	1.91	0.52
1:C:172:ILE:HD11	1:D:172:ILE:HG13	1.92	0.52

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:179:ILE:O	1:C:183:LEU:CD2	2.58	0.51
1:B:189:LEU:O	1:B:192:THR:OG1	2.29	0.50
1:G:171:SER:O	1:G:175:ARG:HB2	2.12	0.50
1:E:190:LEU:HD11	1:H:186:ILE:HG23	1.94	0.49
1:G:181:GLU:HG3	1:G:182:LYS:HE2	1.93	0.49
1:H:175:ARG:HG2	1:H:175:ARG:NH1	2.28	0.48
1:E:190:LEU:CD1	1:H:186:ILE:HG23	2.43	0.48
1:C:172:ILE:HG12	1:D:176:LEU:HD12	1.96	0.47
1:C:190:LEU:HA	1:C:193:LEU:HD13	1.97	0.47
1:G:170:LEU:HD12	1:G:170:LEU:N	2.28	0.47
1:G:178:SER:O	1:G:179:ILE:C	2.52	0.46
1:F:187:LEU:HD22	1:F:191:ARG:HE	1.79	0.45
1:H:190:LEU:O	1:H:193:LEU:HB2	2.16	0.45
1:E:183:LEU:HD11	1:H:179:ILE:HG23	1.98	0.45
1:F:170:LEU:HA	1:F:175:ARG:NH2	2.32	0.44
1:G:178:SER:O	1:G:182:LYS:HG2	2.18	0.44
1:B:178:SER:O	1:B:182:LYS:HG3	2.18	0.44
1:B:175:ARG:H	1:B:175:ARG:HG2	1.63	0.43
1:A:190:LEU:HD11	1:D:186:ILE:HG23	2.01	0.43
1:C:177:GLU:HA	1:C:180:GLU:HG3	2.02	0.42
1:H:193:LEU:HD23	1:H:193:LEU:HA	1.93	0.42
1:E:187:LEU:HD21	1:H:185:MET:CG	2.49	0.41
1:G:178:SER:HA	1:G:181:GLU:HG2	2.02	0.41
1:G:175:ARG:HH21	1:H:176:LEU:HB2	1.85	0.41
1:E:170:LEU:HD22	1:E:170:LEU:HA	1.95	0.41
1:E:172:ILE:HG22	1:F:176:LEU:CD1	2.50	0.40
1:E:179:ILE:HG23	1:F:183:LEU:HD11	2.02	0.40
1:H:171:SER:HB2	1:H:174:ALA:HB3	2.03	0.40

All (2) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:191:ARG:NH2	1:H:181:GLU:OE1[4_455]	1.84	0.36
1:C:173:GLU:OE2	1:H:173:GLU:OE1[3_554]	2.19	0.01

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	22/80 (28%)	21 (96%)	1 (4%)	0	100	100
1	B	23/80 (29%)	23 (100%)	0	0	100	100
1	C	23/80 (29%)	22 (96%)	0	1 (4%)	2	10
1	D	24/80 (30%)	23 (96%)	1 (4%)	0	100	100
1	E	23/80 (29%)	22 (96%)	0	1 (4%)	2	10
1	F	23/80 (29%)	23 (100%)	0	0	100	100
1	G	24/80 (30%)	23 (96%)	1 (4%)	0	100	100
1	H	21/80 (26%)	20 (95%)	0	1 (5%)	2	10
All	All	183/640 (29%)	177 (97%)	3 (2%)	3 (2%)	7	28

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	170	LEU
1	H	172	ILE
1	E	171	SER

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	22/65 (34%)	17 (77%)	5 (23%)	1	4
1	B	23/65 (35%)	16 (70%)	7 (30%)	0	1

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	C	23/65 (35%)	16 (70%)	7 (30%)	0	1
1	D	24/65 (37%)	18 (75%)	6 (25%)	0	2
1	E	23/65 (35%)	17 (74%)	6 (26%)	0	2
1	F	23/65 (35%)	16 (70%)	7 (30%)	0	1
1	G	24/65 (37%)	17 (71%)	7 (29%)	0	1
1	H	21/65 (32%)	16 (76%)	5 (24%)	1	3
All	All	183/520 (35%)	133 (73%)	50 (27%)	0	1

All (50) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	170	LEU
1	A	171	SER
1	A	172	ILE
1	A	189	LEU
1	A	193	LEU
1	B	171	SER
1	B	172	ILE
1	B	175	ARG
1	B	178	SER
1	B	184	SER
1	B	191	ARG
1	B	193	LEU
1	C	171	SER
1	C	172	ILE
1	C	173	GLU
1	C	175	ARG
1	C	177	GLU
1	C	178	SER
1	C	180	GLU
1	D	170	LEU
1	D	177	GLU
1	D	178	SER
1	D	179	ILE
1	D	193	LEU
1	D	194	ASN
1	E	170	LEU
1	E	172	ILE
1	E	175	ARG
1	E	178	SER

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Mol	Chain	Res	Type
1	E	182	LYS
1	E	187	LEU
1	F	172	ILE
1	F	177	GLU
1	F	178	SER
1	F	182	LYS
1	F	189	LEU
1	F	191	ARG
1	F	193	LEU
1	G	170	LEU
1	G	173	GLU
1	G	175	ARG
1	G	177	GLU
1	G	185	MET
1	G	189	LEU
1	G	191	ARG
1	H	171	SER
1	H	177	GLU
1	H	178	SER
1	H	190	LEU
1	H	191	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
1	E	194	ASN
1	F	194	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	24/80 (30%)	-0.17	0 100 100	39, 43, 57, 70	0
1	B	25/80 (31%)	-0.07	0 100 100	45, 49, 59, 88	0
1	C	25/80 (31%)	0.08	0 100 100	47, 55, 66, 72	0
1	D	26/80 (32%)	-0.02	0 100 100	45, 51, 59, 67	0
1	E	25/80 (31%)	0.20	0 100 100	46, 51, 59, 90	0
1	F	25/80 (31%)	0.24	0 100 100	42, 47, 61, 78	0
1	G	26/80 (32%)	-0.05	0 100 100	40, 52, 66, 67	0
1	H	23/80 (28%)	0.17	0 100 100	46, 55, 64, 92	0
All	All	199/640 (31%)	0.05	0 100 100	39, 51, 67, 92	0

There are no RSRZ outliers to report.

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.