



Full wwPDB X-ray Structure Validation Report ⓘ

Feb 13, 2017 – 10:16 am GMT

PDB ID : 5FMM
Title : crystal structure of the mid, cap-binding, mid-link and 627 domains from avian influenza a virus polymerase PB2 subunit bound to M7GTP
Authors : Thierry, E.; Pflug, A.; Hart, D.; Cusack, S.
Deposited on : 2015-11-06
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

A user guide is available at

<http://wwpdb.org/validation/2016/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

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

MolProbity : 4.02b-467
Mogul : 1.7.2 (RC1), CSD as538be (2017)
Xtriage (Phenix) : 1.9-1692
EDS : trunk28620
Percentile statistics : 20161228.v01 (using entries in the PDB archive December 28th 2016)
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) : recalc28949

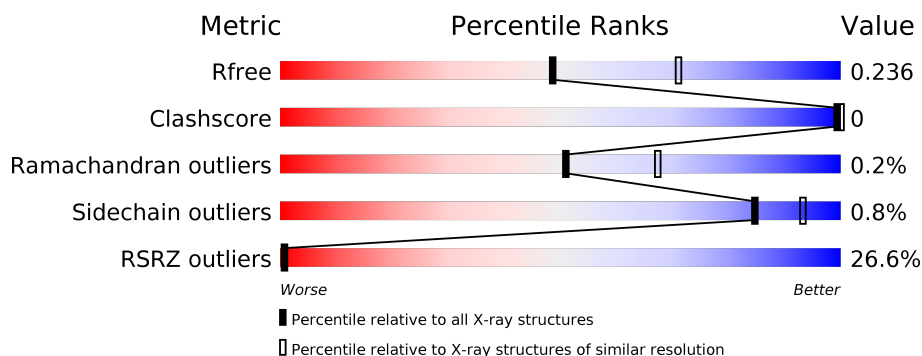
1 Overall quality at a glance

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}	100719	3166 (2.40-2.40)
Clashscore	112137	3674 (2.40-2.40)
Ramachandran outliers	110173	3616 (2.40-2.40)
Sidechain outliers	110143	3617 (2.40-2.40)
RSRZ outliers	101464	3195 (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 ≥ 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	A	490	

2 Entry composition [i](#)

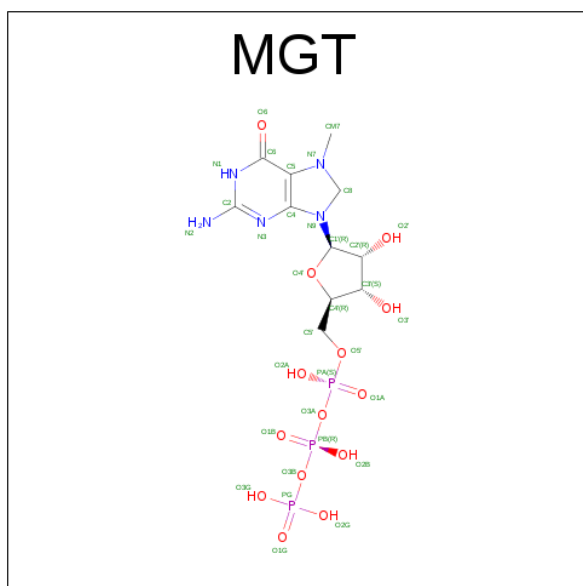
There are 4 unique types of molecules in this entry. The entry contains 3559 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 INFLUENZA A PB2 SUBUNIT.

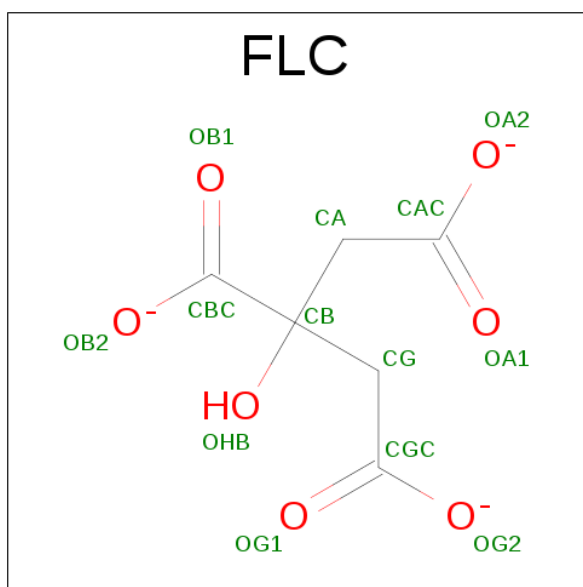
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	425	3388	2126	611	627	24	0	4	0

- Molecule 2 is 7N-METHYL-8-HYDROGUANOSINE-5'-TRIPHOSPHATE (three-letter code: MGT) (formula: C₁₁H₂₀N₅O₁₄P₃).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	P		
2	A	1	33	11	5	14	3	0	0

- Molecule 3 is CITRATE ANION (three-letter code: FLC) (formula: C₆H₅O₇).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	C	O	0	0
			13	6	7		

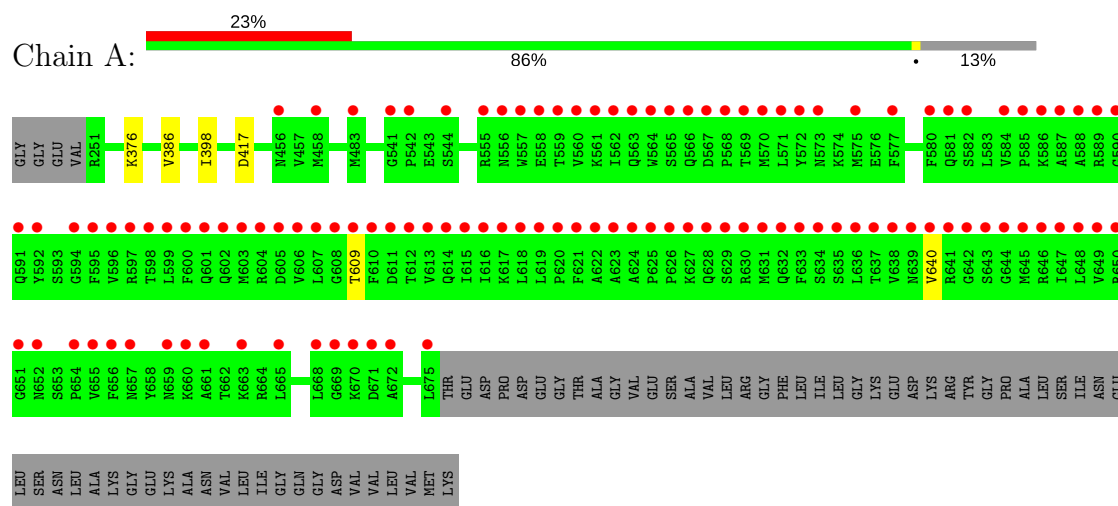
- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	125	Total	O	0	0
			125	125		

3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA and DNA 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: INFLUENZA A PB2 SUBUNIT



4 Data and refinement statistics

Property	Value	Source
Space group	P 32 2 1	Depositor
Cell constants a, b, c, α , β , γ	97.27 Å 97.27 Å 126.22 Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	84.24 – 2.40 48.64 – 2.30	Depositor EDS
% Data completeness (in resolution range)	100.0 (84.24-2.40) 100.0 (48.64-2.30)	Depositor EDS
R_{merge}	0.15	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.70 (at 2.29 Å)	Xtriage
Refinement program	REFMAC 5.8.0131	Depositor
R, R_{free}	0.212 , 0.234 0.217 , 0.236	Depositor DCC
R_{free} test set	1145 reflections (4.33%)	DCC
Wilson B-factor (Å ²)	43.9	Xtriage
Anisotropy	0.358	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.33 , 41.2	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	0.026 for -h,-k,l	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	3559	wwPDB-VP
Average B, all atoms (Å ²)	76.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.83% 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

5.1 Standard geometry

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

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	0.37	0/3441	0.61	0/4640

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	3388	0	3448	1	0
2	A	33	0	16	0	0
3	A	13	0	5	0	0
4	A	125	0	0	0	0
All	All	3559	0	3469	1	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 0.

All (1) 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:386:VAL:HG11	1:A:398:ILE:HD11	1.84	0.59

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	427/490 (87%)	414 (97%)	12 (3%)	1 (0%)	51	67

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	640	VAL

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	376/423 (89%)	373 (99%)	3 (1%)	85	93

All (3) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	376	LYS
1	A	417	ASP
1	A	609	THR

Some 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 carbohydrates in this entry.

5.6 Ligand geometry [i](#)

2 ligands are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the chemical component dictionary. The Link column lists molecule types, if any, to which the group is linked. 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 $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
2	MGT	A	1676	-	29,35,35	1.34	2 (6%)	30,56,56	2.16	5 (16%)
3	FLC	A	1677	-	3,12,12	0.66	0	3,17,17	0.95	0

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the chemical component dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	MGT	A	1676	-	-	0/22/50/50	0/3/3/3
3	FLC	A	1677	-	-	0/6/16/16	0/0/0/0

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	1676	MGT	C5-C4	3.03	1.47	1.39
2	A	1676	MGT	C6-C5	5.23	1.47	1.41

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	1676	MGT	C5-C6-N1	-4.42	116.43	123.37
2	A	1676	MGT	C5-C4-N3	-4.05	119.71	126.47
2	A	1676	MGT	N2-C2-N1	2.46	121.18	117.24
2	A	1676	MGT	C6-N1-C2	4.63	122.72	116.06
2	A	1676	MGT	N3-C4-N9	7.31	136.32	126.98

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, 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	425/490 (86%)	1.42	113 (26%) 1 1	31, 51, 167, 188	0

All (113) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	565	SER	13.2
1	A	628	GLN	13.1
1	A	632	GLN	11.9
1	A	629	SER	10.9
1	A	640	VAL	10.8
1	A	669	GLY	9.9
1	A	627	LYS	9.5
1	A	607	LEU	9.1
1	A	654	PRO	8.5
1	A	643	SER	8.0
1	A	650	ARG	7.8
1	A	610	PHE	7.6
1	A	601	GLN	7.5
1	A	623	ALA	7.1
1	A	563	GLN	7.1
1	A	598	THR	7.1
1	A	618	LEU	6.9
1	A	631	MET	6.9
1	A	648	LEU	6.8
1	A	635	SER	6.7
1	A	564	TRP	6.6
1	A	625	PRO	6.6
1	A	637	THR	6.5
1	A	655	VAL	6.5
1	A	605	ASP	6.4
1	A	634	SER	6.4
1	A	630	ARG	6.2

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Mol	Chain	Res	Type	RSRZ
1	A	646	ARG	6.2
1	A	582	SER	6.0
1	A	647	ILE	6.0
1	A	568	PRO	6.0
1	A	644	GLY	5.9
1	A	594	GLY	5.9
1	A	626	PRO	5.7
1	A	585	PRO	5.7
1	A	542	PRO	5.7
1	A	600	PHE	5.6
1	A	638	VAL	5.5
1	A	604	ARG	5.1
1	A	562	ILE	5.1
1	A	596	VAL	5.0
1	A	572	TYR	5.0
1	A	566	GLN	4.9
1	A	584	VAL	4.8
1	A	645	MET	4.7
1	A	569	THR	4.6
1	A	587	ALA	4.6
1	A	458	MET	4.6
1	A	591	GLN	4.6
1	A	649	VAL	4.6
1	A	573	ASN	4.5
1	A	659	ASN	4.5
1	A	633	PHE	4.5
1	A	580	PHE	4.5
1	A	620	PRO	4.4
1	A	663	LYS	4.3
1	A	557	TRP	4.3
1	A	561	LYS	4.2
1	A	558	GLU	4.2
1	A	592	TYR	4.2
1	A	541	GLY	4.1
1	A	660	LYS	4.0
1	A	622	ALA	4.0
1	A	575	MET	3.9
1	A	639	ASN	3.9
1	A	606	VAL	3.9
1	A	595	PHE	3.8
1	A	642	GLY	3.8
1	A	641	ARG	3.8

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Mol	Chain	Res	Type	RSRZ
1	A	611	ASP	3.8
1	A	675	LEU	3.7
1	A	636	LEU	3.5
1	A	614	GLN	3.5
1	A	624	ALA	3.5
1	A	599	LEU	3.4
1	A	570	MET	3.4
1	A	577	PHE	3.3
1	A	651	GLY	3.3
1	A	603	MET	3.2
1	A	567	ASP	3.2
1	A	597	ARG	3.2
1	A	616	ILE	3.2
1	A	661	ALA	3.2
1	A	613	VAL	3.1
1	A	617	LYS	3.1
1	A	670	LYS	3.1
1	A	615	ILE	3.0
1	A	621	PHE	2.9
1	A	560	VAL	2.9
1	A	589	ARG	2.9
1	A	456	ASN	2.8
1	A	586	LYS	2.8
1	A	657	ASN	2.8
1	A	559	THR	2.7
1	A	588	ALA	2.6
1	A	609	THR	2.6
1	A	571	LEU	2.5
1	A	652	ASN	2.5
1	A	672	ALA	2.5
1	A	656	PHE	2.5
1	A	665	LEU	2.4
1	A	581	GLN	2.4
1	A	602	GLN	2.4
1	A	668	LEU	2.4
1	A	556	ASN	2.4
1	A	612	THR	2.4
1	A	555	ARG	2.3
1	A	671	ASP	2.3
1	A	590	GLY	2.3
1	A	544	SER	2.2
1	A	619	LEU	2.2

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Mol	Chain	Res	Type	RSRZ
1	A	608	GLY	2.2
1	A	483	MET	2.1

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, 95th 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(Å ²)	Q<0.9
3	FLC	A	1677	13/13	0.77	0.17	-0.28	71,81,83,85	0
2	MGT	A	1676	33/33	0.97	0.14	-1.19	42,45,48,49	0

6.5 Other polymers [i](#)

There are no such residues in this entry.