



# wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 5, 2026 – 07:03 PM UTC

PDB ID : 7JYX / pdb\_00007jyx  
Title : Crystal Structure of HLA A\*2402 in complex with TYQWIIRNWET, an 11-mer epitope from Influenza  
Authors : Gras, S.; Nguyen, A.T.; Szeto, C.; Rossjohn, J.  
Deposited on : 2020-09-01  
Resolution : 2.95 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](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>.

---

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

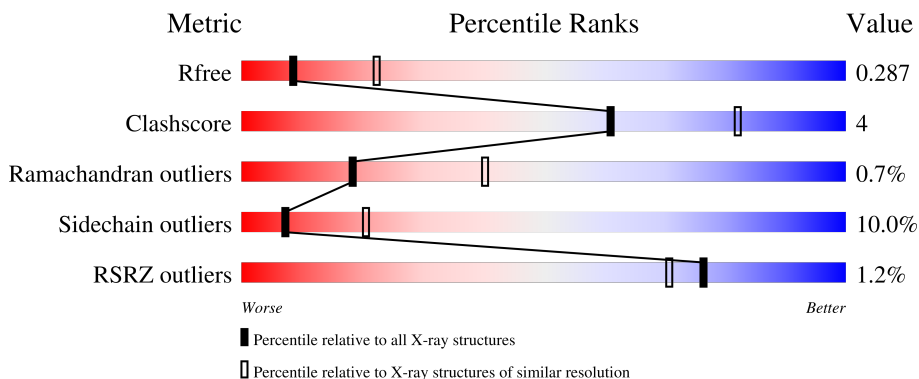
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.95 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	1130 (2.98-2.94)
Clashscore	190562	1157 (2.98-2.94)
Ramachandran outliers	187476	1101 (2.98-2.94)
Sidechain outliers	187428	1101 (2.98-2.94)
RSRZ outliers	180081	1130 (2.98-2.94)

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	278	 3% 79% 17% ..
1	D	278	 75% 21% ..
2	B	100	 76% 20% ..
2	E	100	 % 71% 27% .
3	C	11	 82% 18%

*Continued on next page...*

*Continued from previous page...*

Mol	Chain	Length	Quality of chain
3	F	11	 55% 27% 9% 9%

## 2 Entry composition [i](#)

There are 4 unique types of molecules in this entry. The entry contains 6373 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 MHC class I antigen.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	272	Total	C	N	O	S	0	1	0
			2207	1371	401	425	10			
1	D	274	Total	C	N	O	S	0	0	0
			2221	1382	403	426	10			

- Molecule 2 is a protein called Beta-2-microglobulin.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	98	Total	C	N	O	S	0	0	0
			820	523	139	156	2			
2	E	100	Total	C	N	O	S	0	0	0
			837	533	141	159	4			

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	0	MET	-	initiating methionine	UNP P61769
E	0	MET	-	initiating methionine	UNP P61769

- Molecule 3 is a protein called PB2 peptide from Influenza, TYQWIIRNWET.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
			Total	C	N	O			
3	C	11	Total	C	N	O	0	0	0
			108	71	18	19			
3	F	11	Total	C	N	O	0	0	0
			108	71	18	19			

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	28	Total	O	0	0
			28	28		

*Continued on next page...*

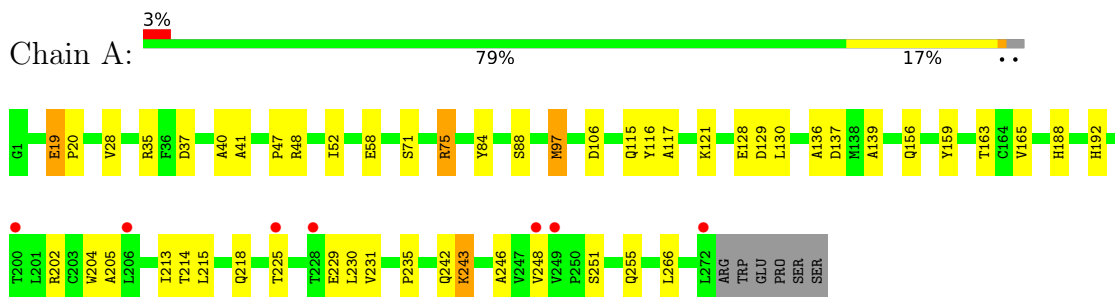
*Continued from previous page...*

<b>Mol</b>	<b>Chain</b>	<b>Residues</b>	<b>Atoms</b>	<b>ZeroOcc</b>	<b>AltConf</b>
4	B	10	Total O 10 10	0	0
4	C	2	Total O 2 2	0	0
4	D	19	Total O 19 19	0	0
4	E	12	Total O 12 12	0	0
4	F	1	Total O 1 1	0	0

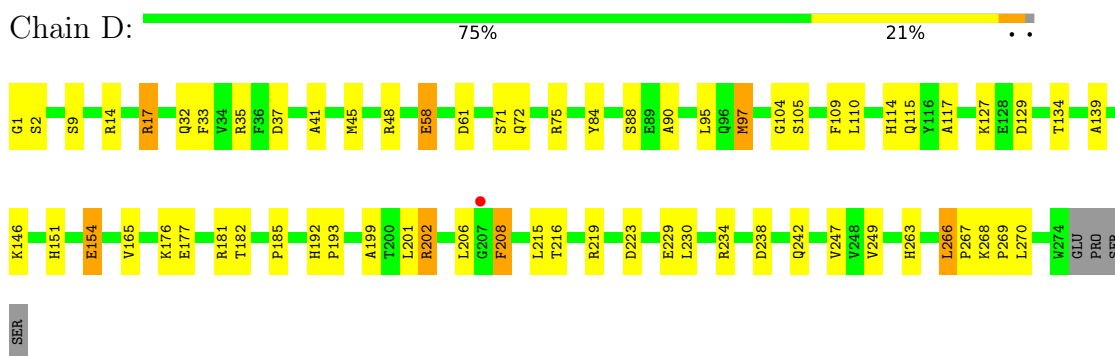
### 3 Residue-property plots [i](#)

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.

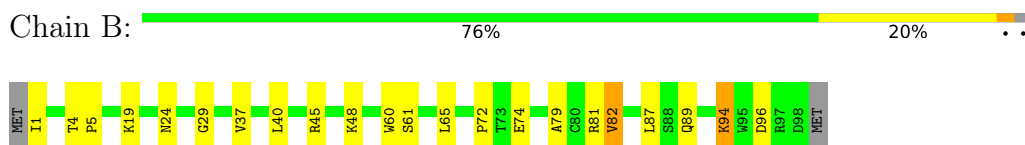
- Molecule 1: MHC class I antigen



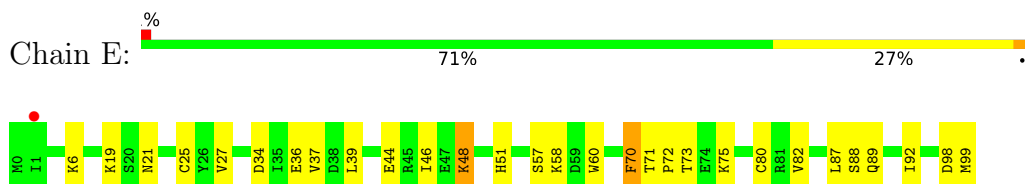
- Molecule 1: MHC class I antigen




- Molecule 2: Beta-2-microglobulin

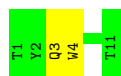


- Molecule 2: Beta-2-microglobulin



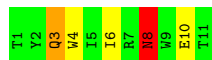
- Molecule 3: PB2 peptide from Influenza, TYQWIIRNWET

Chain C:  82% 18%



- Molecule 3: PB2 peptide from Influenza, TYQWIIRNWET

Chain F:  55% 27% 9% 9%



## 4 Data and refinement statistics

Property	Value	Source
Space group	I 1 2 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	89.68Å 43.65Å 236.49Å 90.00° 95.56° 90.00°	Depositor
Resolution (Å)	39.21 – 2.95 39.21 – 2.95	Depositor EDS
% Data completeness (in resolution range)	99.4 (39.21-2.95) 99.3 (39.21-2.95)	Depositor EDS
$R_{merge}$	0.09	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.92 (at 2.95Å)	Xtrriage
Refinement program	BUSTER 2.10.3	Depositor
R, $R_{free}$	0.208 , 0.275 0.217 , 0.287	Depositor DCC
$R_{free}$ test set	989 reflections (5.01%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	59.3	Xtrriage
Anisotropy	0.311	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.26 , 52.7	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.50$ , $\langle L^2 \rangle = 0.34$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.93	EDS
Total number of atoms	6373	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	64.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.96% 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	0.83	0/2265	1.36	18/3069 (0.6%)
1	D	0.85	0/2281	1.34	17/3092 (0.5%)
2	B	0.85	0/843	1.30	3/1142 (0.3%)
2	E	0.81	0/860	1.35	9/1162 (0.8%)
3	C	0.77	0/112	1.06	0/152
3	F	0.73	0/112	1.11	1/152 (0.7%)
All	All	0.83	0/6473	1.33	48/8769 (0.5%)

There are no bond length outliers.

The worst 5 of 48 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	E	71	THR	CB-CA-C	7.03	117.50	110.33
1	D	33	PHE	CA-CB-CG	7.00	120.80	113.80
1	A	40	ALA	CA-C-N	6.80	129.72	120.54
1	A	40	ALA	C-N-CA	6.80	129.72	120.54
1	D	208	PHE	CA-CB-CG	6.74	120.54	113.80

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	2207	0	2073	16	0
1	D	2221	0	2082	20	0

*Continued on next page...*

Continued from previous page...

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	B	820	0	785	10	0
2	E	837	0	805	6	0
3	C	108	0	100	4	0
3	F	108	0	100	3	0
4	A	28	0	0	1	0
4	B	10	0	0	0	0
4	C	2	0	0	0	0
4	D	19	0	0	0	0
4	E	12	0	0	0	0
4	F	1	0	0	0	0
All	All	6373	0	5945	51	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 4.

The worst 5 of 51 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:121:LYS:HD2	2:B:1:ILE:HG12	1.66	0.77
2:E:25:CYS:HB2	2:E:39:LEU:HD21	1.79	0.65
1:A:35:ARG:HD2	1:A:48[B]:ARG:HE	1.64	0.63
2:B:24:ASN:HB3	2:B:65:LEU:HD11	1.85	0.58
1:D:185:PRO:HB3	1:D:208:PHE:HB3	1.87	0.55

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	271/278 (98%)	255 (94%)	14 (5%)	2 (1%)	18	40
1	D	272/278 (98%)	235 (86%)	34 (12%)	3 (1%)	11	29

Continued on next page...

Continued from previous page...

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
2	B	96/100 (96%)	89 (93%)	7 (7%)	0	100	100
2	E	98/100 (98%)	92 (94%)	6 (6%)	0	100	100
3	C	9/11 (82%)	8 (89%)	1 (11%)	0	100	100
3	F	9/11 (82%)	9 (100%)	0	0	100	100
All	All	755/778 (97%)	688 (91%)	62 (8%)	5 (1%)	18	40

All (5) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	D	176	LYS
1	D	223	ASP
1	A	136	ALA
1	A	251	SER
1	D	267	PRO

### 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	229/234 (98%)	211 (92%)	18 (8%)	11	29
1	D	230/234 (98%)	205 (89%)	25 (11%)	6	18
2	B	93/95 (98%)	87 (94%)	6 (6%)	15	37
2	E	95/95 (100%)	80 (84%)	15 (16%)	2	8
3	C	11/11 (100%)	11 (100%)	0	100	100
3	F	11/11 (100%)	8 (73%)	3 (27%)	0	0
All	All	669/680 (98%)	602 (90%)	67 (10%)	7	20

5 of 67 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	E	58	LYS
2	E	88	SER

Continued on next page...

*Continued from previous page...*

Mol	Chain	Res	Type
3	F	6	ILE
1	D	9	SER
2	B	94	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 25 such sidechains are listed below:

Mol	Chain	Res	Type
1	D	32	GLN
1	D	174	ASN
3	F	8	ASN
1	D	93	HIS
1	D	191	HIS

### 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, 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	272/278 (97%)	0.17	7 (2%) 57 49	20, 52, 124, 148	1 (0%)
1	D	274/278 (98%)	0.11	1 (0%) 88 86	32, 59, 97, 109	0
2	B	98/100 (98%)	0.36	0 100 100	43, 79, 101, 112	0
2	E	100/100 (100%)	0.22	1 (1%) 79 74	31, 64, 89, 100	0
3	C	11/11 (100%)	-0.35	0 100 100	31, 39, 46, 58	0
3	F	11/11 (100%)	-0.21	0 100 100	31, 41, 50, 51	0
All	All	766/778 (98%)	0.17	9 (1%) 76 71	20, 60, 108, 148	1 (0%)

The worst 5 of 9 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	E	1	ILE	3.0
1	A	249	VAL	2.8
1	A	248	VAL	2.6
1	A	206	LEU	2.5
1	A	228	THR	2.4

### 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.