



# Full wwPDB X-ray Structure Validation Report ⓘ

May 25, 2020 – 12:55 am BST

PDB ID : 5XXY  
Title : Crystal structure of PD-L1 complexed with atezolizumab fab at 2.9Å  
Authors : Zhou, A.; Zhang, F.  
Deposited on : 2017-07-05  
Resolution : 2.90 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.

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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 : 2.11  
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) : 2.11

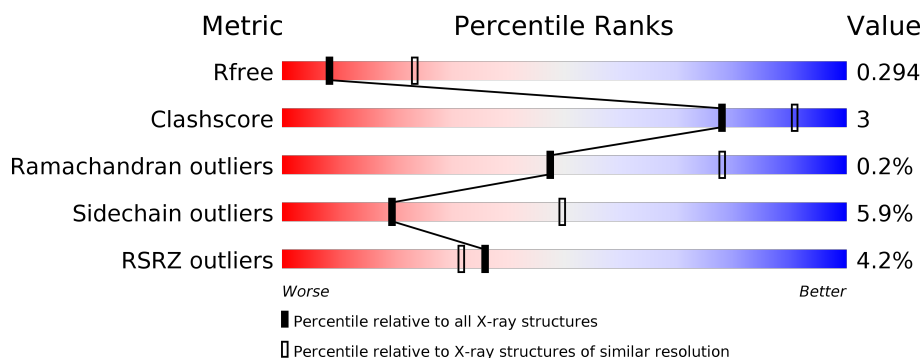
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

## *X-RAY DIFFRACTION*

The reported resolution of this entry is 2.90 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	1957 (2.90-2.90)
Clashscore	141614	2172 (2.90-2.90)
Ramachandran outliers	138981	2115 (2.90-2.90)
Sidechain outliers	138945	2117 (2.90-2.90)
RSRZ outliers	127900	1906 (2.90-2.90)

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  $\geq 3$ , 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	H	240	<div> <div style="width: 100%; height: 10px; background-color: red;"></div> <div style="display: flex; justify-content: space-between; align-items: center;"> <span>%</span> <span style="flex-grow: 1; border-bottom: 1px solid black;"></span> <span></span> </div> <div style="display: flex; justify-content: space-between; align-items: center;"> <span>76%</span> <span>10%</span> <span>13%</span> </div> </div>
2	L	214	<div> <div style="width: 6%; height: 10px; background-color: red;"></div> <div style="display: flex; justify-content: space-between; align-items: center;"> <span>6%</span> <span style="flex-grow: 1; border-bottom: 1px solid black;"></span> <span></span> </div> <div style="display: flex; justify-content: space-between; align-items: center;"> <span>86%</span> <span>12%</span> <span>.</span> </div> </div>
3	A	124	<div> <div style="width: 5%; height: 10px; background-color: red;"></div> <div style="display: flex; justify-content: space-between; align-items: center;"> <span>5%</span> <span style="flex-grow: 1; border-bottom: 1px solid black;"></span> <span></span> </div> <div style="display: flex; justify-content: space-between; align-items: center;"> <span>71%</span> <span>9%</span> <span>20%</span> </div> </div>

## 2 Entry composition [i](#)

There are 4 unique types of molecules in this entry. The entry contains 7868 atoms, of which 3889 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 heavy chain of atezolizumab fab.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	H	208	Total	C	H	N	O	S	0	0	0
			3087	1001	1517	263	301	5			

- Molecule 2 is a protein called light chain of atezolizumab fab.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
2	L	211	Total	C	H	N	O	S	0	0	0
			3207	1022	1582	270	328	5			

- Molecule 3 is a protein called Programmed cell death 1 ligand 1.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
3	A	99	Total	C	H	N	O	S	0	0	0
			1572	503	790	129	145	5			

There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	134	GLY	-	expression tag	UNP Q9NZQ7
A	135	SER	-	expression tag	UNP Q9NZQ7
A	136	HIS	-	expression tag	UNP Q9NZQ7
A	137	HIS	-	expression tag	UNP Q9NZQ7
A	138	HIS	-	expression tag	UNP Q9NZQ7
A	139	HIS	-	expression tag	UNP Q9NZQ7
A	140	HIS	-	expression tag	UNP Q9NZQ7
A	141	HIS	-	expression tag	UNP Q9NZQ7

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	H	1	Total	O	0	0
			1	1		

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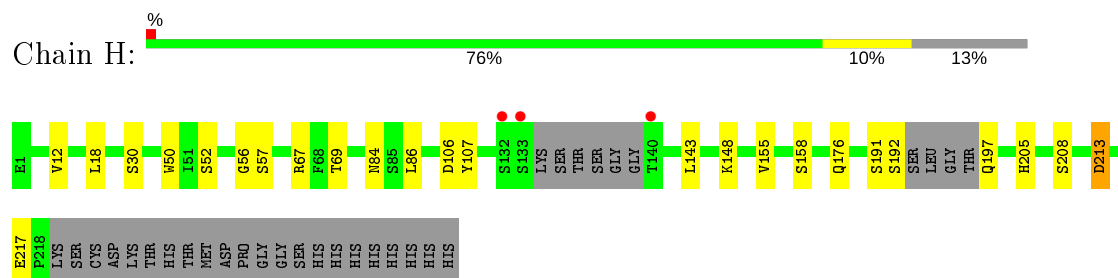
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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	L	1	Total	O	0	0
			1	1		

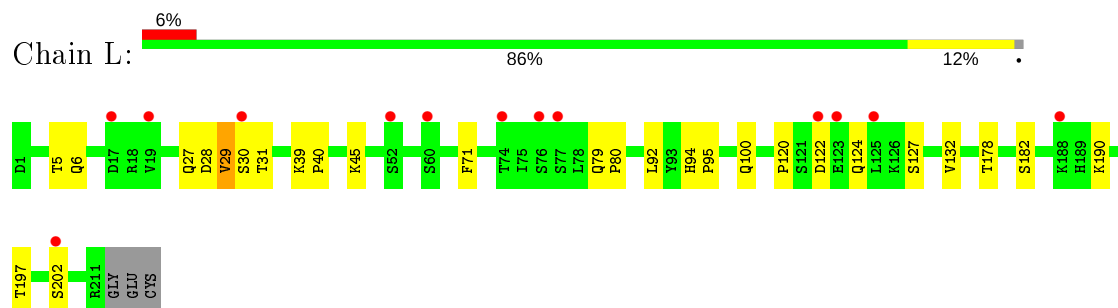
### 3 Residue-property plots [i](#)

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.

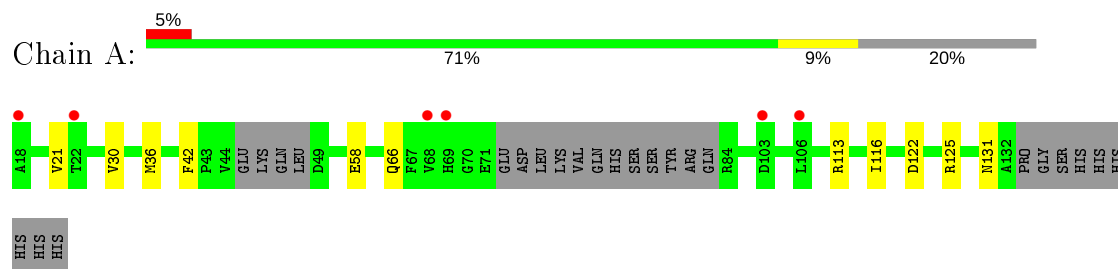
- Molecule 1: heavy chain of atezolizumab fab



- Molecule 2: light chain of atezolizumab fab



- Molecule 3: Programmed cell death 1 ligand 1



## 4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	127.22Å 72.71Å 63.80Å 90.00° 104.44° 90.00°	Depositor
Resolution (Å)	61.60 – 2.90 61.60 – 2.90	Depositor EDS
% Data completeness (in resolution range)	92.9 (61.60-2.90) 93.1 (61.60-2.90)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.85 (at 2.91Å)	Xtriage
Refinement program	PHENIX 1.8.2_1309	Depositor
R, $R_{free}$	0.236 , 0.295 0.236 , 0.294	Depositor DCC
$R_{free}$ test set	547 reflections (4.65%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	26.6	Xtriage
Anisotropy	1.299	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.44 , 49.8	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.46$ , $\langle L^2 \rangle = 0.29$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
$F_o, F_c$ correlation	0.86	EDS
Total number of atoms	7868	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	50.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 7.25% 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	H	0.25	0/1615	0.43	0/2206
2	L	0.26	0/1662	0.46	0/2259
3	A	0.24	0/793	0.45	0/1070
All	All	0.25	0/4070	0.45	0/5535

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	H	1570	1517	1513	8	0
2	L	1625	1582	1579	10	0
3	A	782	790	789	5	0
4	H	1	0	0	0	0
4	L	1	0	0	1	0
All	All	3979	3889	3881	23	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 (23) 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)
3:A:21:VAL:HG23	3:A:122:ASP:HB3	1.71	0.72
1:H:67:ARG:O	1:H:84:ASN:ND2	2.23	0.71
2:L:190:LYS:NZ	4:L:301:HOH:O	2.26	0.68
2:L:120:PRO:HD3	2:L:132:VAL:HG22	1.77	0.65
3:A:21:VAL:HG22	3:A:116:ILE:HD11	1.85	0.58
1:H:148:LYS:NZ	1:H:176:GLN:OE1	2.31	0.56
1:H:106:ASP:OD1	1:H:107:TYR:N	2.40	0.54
2:L:29:VAL:HG12	2:L:30:SER:N	2.24	0.52
2:L:5:THR:O	2:L:5:THR:OG1	2.27	0.51
3:A:58:GLU:OE2	3:A:113:ARG:NH1	2.47	0.48
2:L:29:VAL:HG12	2:L:30:SER:H	1.80	0.47
1:H:12:VAL:HG11	1:H:86:LEU:HD12	1.97	0.46
1:H:205:HIS:ND1	1:H:208:SER:OG	2.49	0.46
2:L:39:LYS:HB2	2:L:40:PRO:HD2	1.96	0.46
2:L:6:GLN:O	2:L:100:GLN:NE2	2.48	0.46
2:L:79:GLN:HG3	2:L:80:PRO:HD2	1.97	0.45
1:H:213:ASP:OD1	1:H:213:ASP:N	2.46	0.45
1:H:52:SER:O	1:H:56:GLY:N	2.47	0.45
2:L:94:HIS:HA	2:L:95:PRO:C	2.38	0.44
3:A:42:PHE:HB3	3:A:116:ILE:CD1	2.49	0.43
1:H:217:GLU:N	1:H:217:GLU:OE1	2.47	0.42
3:A:30:VAL:HG11	3:A:36:MET:HB3	2.02	0.42
2:L:124:GLN:O	2:L:127:SER:OG	2.29	0.40

There are no symmetry-related clashes.

## 5.3 Torsion angles ⓘ

### 5.3.1 Protein backbone ⓘ

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	H	202/240 (84%)	192 (95%)	10 (5%)	0	100	100
2	L	209/214 (98%)	197 (94%)	11 (5%)	1 (0%)	29	61
3	A	93/124 (75%)	88 (95%)	5 (5%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles
All	All	504/578 (87%)	477 (95%)	26 (5%)	1 (0%)	47 78

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	L	29	VAL

### 5.3.2 Protein sidechains ⓘ

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	H	171/198 (86%)	159 (93%)	12 (7%)	15 41
2	L	185/187 (99%)	174 (94%)	11 (6%)	19 49
3	A	84/108 (78%)	81 (96%)	3 (4%)	35 69
All	All	440/493 (89%)	414 (94%)	26 (6%)	19 49

All (26) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	H	18	LEU
1	H	30	SER
1	H	50	TRP
1	H	57	SER
1	H	69	THR
1	H	143	LEU
1	H	155	VAL
1	H	158	SER
1	H	191	SER
1	H	192	SER
1	H	197	GLN
1	H	213	ASP
2	L	27	GLN
2	L	28	ASP
2	L	31	THR

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Mol	Chain	Res	Type
2	L	45	LYS
2	L	71	PHE
2	L	92	LEU
2	L	122	ASP
2	L	178	THR
2	L	182	SER
2	L	197	THR
2	L	202	SER
3	A	66	GLN
3	A	125	ARG
3	A	131	ASN

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such sidechains are listed below:

Mol	Chain	Res	Type
1	H	84	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 carbohydrates 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

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	H	208/240 (86%)	0.35	3 (1%) 75 75	27, 42, 60, 71	0
2	L	211/214 (98%)	0.60	13 (6%) 20 16	27, 46, 62, 77	0
3	A	99/124 (79%)	0.64	6 (6%) 21 17	29, 48, 69, 77	0
All	All	518/578 (89%)	0.50	22 (4%) 36 32	27, 45, 62, 77	0

All (22) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	L	125	LEU	3.7
3	A	69	HIS	3.6
2	L	17	ASP	3.5
2	L	122	ASP	3.4
2	L	74	THR	3.2
1	H	132	SER	3.2
2	L	19	VAL	3.1
3	A	22	THR	3.0
2	L	123	GLU	2.8
3	A	18	ALA	2.6
1	H	133	SER	2.6
2	L	76	SER	2.5
2	L	77	SER	2.4
3	A	68	VAL	2.4
2	L	30	SER	2.4
2	L	188	LYS	2.4
1	H	140	THR	2.4
3	A	106	LEU	2.3
3	A	103	ASP	2.2
2	L	202	SER	2.0
2	L	60	SER	2.0
2	L	52	SER	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 carbohydrates 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.