



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 9, 2026 – 11:36 AM UTC

PDB ID : 8P64 / pdb_00008p64
Title : Co-crystal structure of PD-L1 with low molecular weight inhibitor
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Butera, R.; Land, L.; Musielak, B.; Domling, A.
Deposited on : 2023-05-25
Resolution : 3.31 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
Mogul : **NOT EXECUTED**
Xtrriage (Phenix) : 2.0
EDS : **NOT EXECUTED**
Buster-report : **NOT EXECUTED**
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

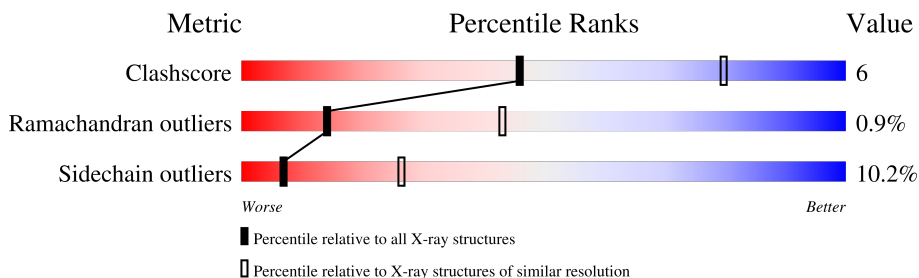
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 3.31 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))
Clashscore	190562	1193 (3.34-3.30)
Ramachandran outliers	187476	1172 (3.34-3.30)
Sidechain outliers	187428	1171 (3.34-3.30)

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 $\leq 5\%$

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	131	
1	B	131	

2 Entry composition [i](#)

There are 3 unique types of molecules in this entry. The entry contains 3548 atoms, of which 1749 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 Programmed cell death 1 ligand 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace	
			Total	C	H	N	O				S
1	A	117	1731	560	853	145	168	5	35	0	0
1	B	118	1762	564	875	151	167	5	34	0	0

There are 28 discrepancies between the modelled and reference sequences:

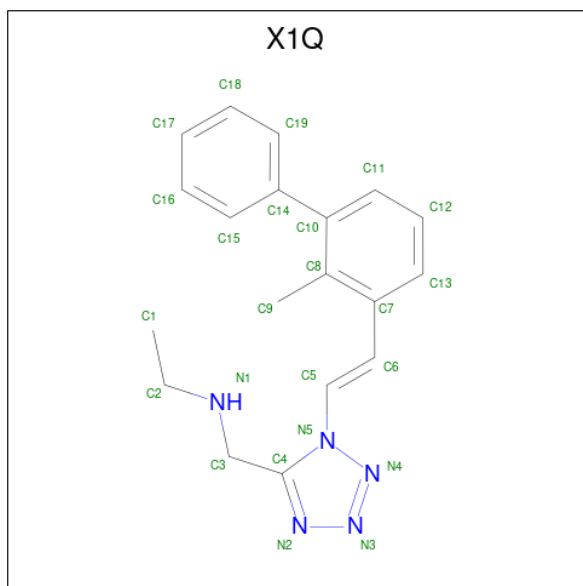
Chain	Residue	Modelled	Actual	Comment	Reference
A	1	MET	-	initiating methionine	UNP Q9NZQ7
A	2	GLY	-	expression tag	UNP Q9NZQ7
A	3	SER	-	expression tag	UNP Q9NZQ7
A	121	ALA	-	expression tag	UNP Q9NZQ7
A	122	ALA	-	expression tag	UNP Q9NZQ7
A	123	ALA	-	expression tag	UNP Q9NZQ7
A	124	LEU	-	expression tag	UNP Q9NZQ7
A	125	GLU	-	expression tag	UNP Q9NZQ7
A	126	HIS	-	expression tag	UNP Q9NZQ7
A	127	HIS	-	expression tag	UNP Q9NZQ7
A	128	HIS	-	expression tag	UNP Q9NZQ7
A	129	HIS	-	expression tag	UNP Q9NZQ7
A	130	HIS	-	expression tag	UNP Q9NZQ7
A	131	HIS	-	expression tag	UNP Q9NZQ7
B	1	MET	-	initiating methionine	UNP Q9NZQ7
B	2	GLY	-	expression tag	UNP Q9NZQ7
B	3	SER	-	expression tag	UNP Q9NZQ7
B	121	ALA	-	expression tag	UNP Q9NZQ7
B	122	ALA	-	expression tag	UNP Q9NZQ7
B	123	ALA	-	expression tag	UNP Q9NZQ7
B	124	LEU	-	expression tag	UNP Q9NZQ7
B	125	GLU	-	expression tag	UNP Q9NZQ7
B	126	HIS	-	expression tag	UNP Q9NZQ7
B	127	HIS	-	expression tag	UNP Q9NZQ7
B	128	HIS	-	expression tag	UNP Q9NZQ7

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Chain	Residue	Modelled	Actual	Comment	Reference
B	129	HIS	-	expression tag	UNP Q9NZQ7
B	130	HIS	-	expression tag	UNP Q9NZQ7
B	131	HIS	-	expression tag	UNP Q9NZQ7

- Molecule 2 is {N}-[[1-[({E})-2-(2-methyl-3-phenyl-phenyl)ethenyl]-1,2,3,4-tetrazol-5-yl]methyl]ethanamine (CCD ID: X1Q) (formula: C₁₉H₂₁N₅) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	H	N		
2	B	1	45	19	21	5	0	0

- Molecule 3 is water.

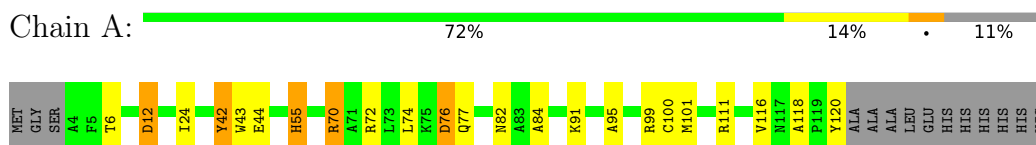
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	4	Total	O	0	0
			4	4		
3	B	6	Total	O	0	0
			6	6		

3 Residue-property plots [i](#)

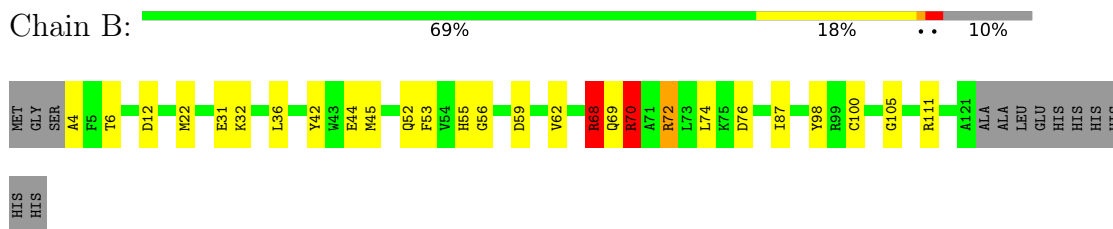
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry. Residues are color-coded 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. 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.

Note EDS was not executed.

- Molecule 1: Programmed cell death 1 ligand 1



- Molecule 1: Programmed cell death 1 ligand 1



4 Data and refinement statistics

EDS was not executed - this section is therefore incomplete.

Property	Value	Source
Space group	P 31 2 1	Depositor
Cell constants a, b, c, α , β , γ	73.45Å 73.45Å 96.08Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	38.34 – 3.31	Depositor
% Data completeness (in resolution range)	99.9 (38.34-3.31)	Depositor
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.27 (at 3.32Å)	Xtrriage
Refinement program	REFMAC 5.8.0411	Depositor
R, R_{free}	0.234 , 0.297	Depositor
Wilson B-factor (Å ²)	110.3	Xtrriage
Anisotropy	0.153	Xtrriage
L-test for twinning ²	$\langle L \rangle = 0.46$, $\langle L^2 \rangle = 0.30$	Xtrriage
Estimated twinning fraction	0.057 for -h,-k,l	Xtrriage
Total number of atoms	3548	wwPDB-VP
Average B, all atoms (Å ²)	108.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 8.89% 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](#)

Bond lengths and bond angles in the following residue types are not validated in this section: X1Q

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	0.62	0/894	1.24	4/1219 (0.3%)
1	B	0.59	0/902	1.13	3/1229 (0.2%)
All	All	0.61	0/1796	1.19	7/2448 (0.3%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	1
1	B	0	3
All	All	0	4

There are no bond length outliers.

All (7) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed($^{\circ}$)	Ideal($^{\circ}$)
1	A	55	HIS	CB-CA-C	11.45	128.82	112.11
1	A	12	ASP	CA-CB-CG	7.94	120.54	112.60
1	B	68	ARG	CB-CG-CD	7.22	127.91	111.30
1	A	99	ARG	CG-CD-NE	6.79	126.94	112.00
1	A	55	HIS	CA-CB-CG	6.45	120.25	113.80
1	B	12	ASP	CB-CA-C	-5.39	99.38	110.38
1	B	68	ARG	CG-CD-NE	-5.18	100.61	112.00

There are no chirality outliers.

All (4) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	70	ARG	Sidechain
1	B	68	ARG	Sidechain
1	B	70	ARG	Sidechain
1	B	72	ARG	Sidechain

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	878	853	822	8	2
1	B	887	875	846	11	1
2	B	24	21	0	1	0
3	A	4	0	0	3	0
3	B	6	0	0	0	1
All	All	1799	1749	1668	19	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 6.

All (19) 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:24:ILE:O	3:A:201:HOH:O	1.90	0.89
1:A:43:TRP:CZ2	3:A:201:HOH:O	2.35	0.79
1:B:42:TYR:HE1	1:B:44:GLU:HB2	1.65	0.62
1:B:4:ALA:N	1:B:105:GLY:O	2.33	0.61
1:B:42:TYR:CE1	1:B:44:GLU:HB2	2.40	0.55
1:B:59:ASP:O	1:B:62:VAL:HG12	2.06	0.55
1:B:53:PHE:CZ	1:B:56:GLY:HA2	2.41	0.55
1:A:77:GLN:HB3	1:A:82:ASN:HB3	1.90	0.54
1:B:36:LEU:O	1:B:55:HIS:HA	2.08	0.53
1:A:95:ALA:HB2	1:A:116:VAL:HG23	1.91	0.51
1:A:76:ASP:OD1	3:A:202:HOH:O	2.19	0.50
1:A:74:LEU:HB2	1:A:84:ALA:HB3	1.92	0.49
1:A:42:TYR:CE1	1:A:44:GLU:HB2	2.51	0.45
1:B:68:ARG:O	1:B:70:ARG:HG2	2.17	0.45
1:B:52:GLN:NE2	2:B:201:X1Q:N2	2.66	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:45:MET:HE2	1:B:98:TYR:CE1	2.53	0.43
1:B:22:MET:HE3	1:B:87:ILE:HD12	2.00	0.43
1:B:100:CYS:SG	1:B:100:CYS:O	2.78	0.41
1:A:100:CYS:O	1:A:100:CYS:SG	2.78	0.41

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:A:120:TYR:HB3	3:B:306:HOH:O[3_664]	1.51	0.09
1:A:118:ALA:O	1:B:36:LEU:H[6_664]	1.58	0.02

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	115/131 (88%)	111 (96%)	4 (4%)	0	100	100
1	B	116/131 (88%)	109 (94%)	5 (4%)	2 (2%)	7	31
All	All	231/262 (88%)	220 (95%)	9 (4%)	2 (1%)	14	43

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	31	GLU
1	B	32	LYS

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	88/112 (79%)	78 (89%)	10 (11%)	5	22
1	B	89/112 (80%)	81 (91%)	8 (9%)	9	32
All	All	177/224 (79%)	159 (90%)	18 (10%)	7	26

All (18) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	6	THR
1	A	12	ASP
1	A	42	TYR
1	A	55	HIS
1	A	70	ARG
1	A	72	ARG
1	A	76	ASP
1	A	91	LYS
1	A	101	MET
1	A	111	ARG
1	B	6	THR
1	B	68	ARG
1	B	69	GLN
1	B	70	ARG
1	B	72	ARG
1	B	74	LEU
1	B	76	ASP
1	B	111	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (3) such sidechains are listed below:

Mol	Chain	Res	Type
1	B	52	GLN
1	B	55	HIS
1	B	69	GLN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains [i](#)

Mogul was not executed - this section is therefore empty.

5.5 Carbohydrates [i](#)

Mogul was not executed - this section is therefore empty.

5.6 Ligand geometry [i](#)

Mogul was not executed - this section is therefore empty.

5.7 Other polymers [i](#)

Mogul was not executed - this section is therefore empty.

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](#)

EDS was not executed - this section is therefore empty.

6.2 Non-standard residues in protein, DNA, RNA chains [i](#)

EDS was not executed - this section is therefore empty.

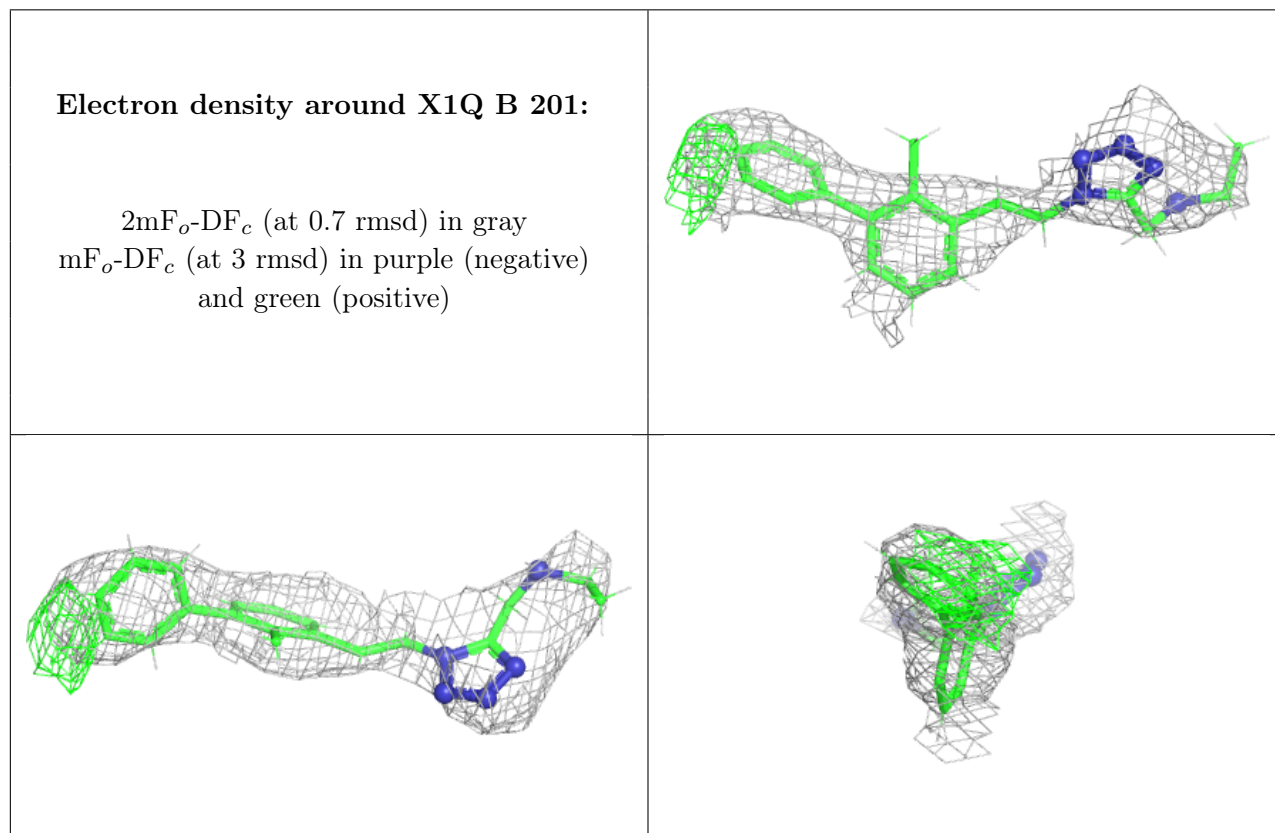
6.3 Carbohydrates [i](#)

EDS was not executed - this section is therefore empty.

6.4 Ligands [i](#)

EDS was not executed - this section is therefore empty.

The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.



6.5 Other polymers

EDS was not executed - this section is therefore empty.