



wwPDB X-ray Structure Validation Summary Report ⓘ

Sep 23, 2023 – 09:42 PM EDT

PDB ID : 5TEZ
Title : TCR F50 recognizing M1-HLA-A2
Authors : Yang, X.; Mariuzza, R.A.
Deposited on : 2016-09-23
Resolution : 1.70 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

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 : 4.02b-467
Xtriage (Phenix) : 1.13
EDS : 2.35.1
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) : 2.35.1

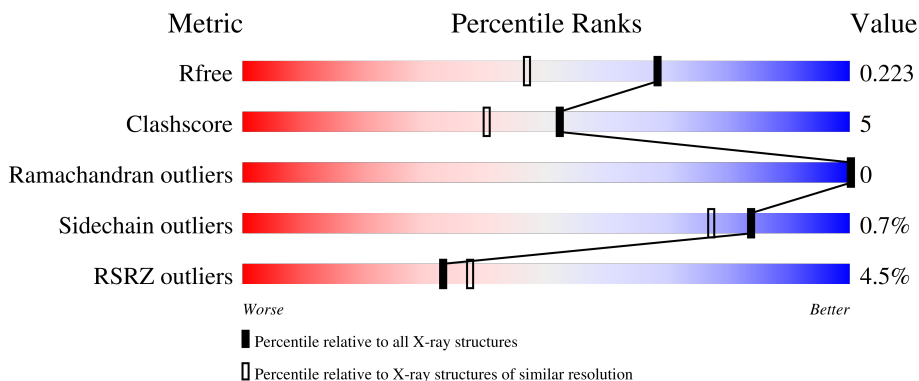
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.70 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	4298 (1.70-1.70)
Clashscore	141614	4695 (1.70-1.70)
Ramachandran outliers	138981	4610 (1.70-1.70)
Sidechain outliers	138945	4610 (1.70-1.70)
RSRZ outliers	127900	4222 (1.70-1.70)

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	C	9	78% (green), 22% (yellow)
2	A	275	5% (red), 80% (green), 19% (yellow), . (grey)
3	B	100	6% (red), 80% (green), 19% (yellow), . (grey)
4	I	208	4% (red), 80% (green), 16% (yellow), .. (grey)
5	J	243	3% (red), 84% (green), 14% (yellow), .. (grey)

2 Entry composition [i](#)

There are 6 unique types of molecules in this entry. The entry contains 7466 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 GLY-ILE-LEU-GLY-PHE-VAL-PHE-THR-LEU.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
			Total	C	N	O			
1	C	9	68	49	9	10	0	0	0

- Molecule 2 is a protein called HLA class I histocompatibility antigen, A-2 alpha chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	A	275	2246	1403	409	425	9	0	0	0

- Molecule 3 is a protein called Beta-2-microglobulin.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
3	B	100	834	531	141	159	3	0	0	0

- Molecule 4 is a protein called TCR F50 alpha chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
4	I	202	1586	992	268	319	7	0	0	0

- Molecule 5 is a protein called TCR F50 beta chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
5	J	240	1927	1219	334	366	8	0	0	0

- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
6	C	4	4	4	0	0

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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	246	Total 246	O 246	0	0
6	B	125	Total 125	O 125	0	0
6	I	187	Total 187	O 187	0	0
6	J	243	Total 243	O 243	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.

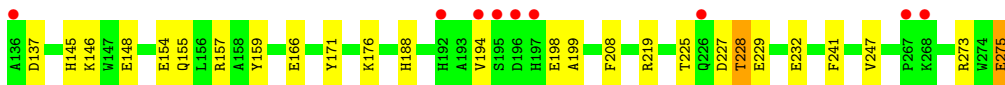
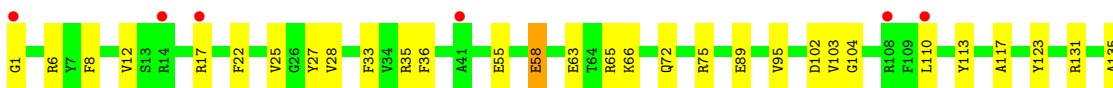
- Molecule 1: GLY-ILE-LEU-GLY-PHE-VAL-PHE-THR-LEU

Chain C: 78% 22%



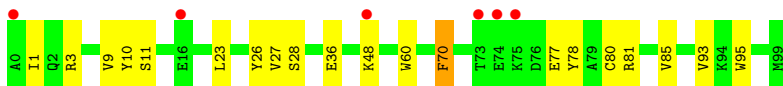
- Molecule 2: HLA class I histocompatibility antigen, A-2 alpha chain

Chain A: 5% 80% 19%



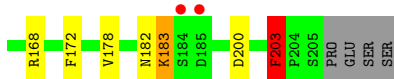
- Molecule 3: Beta-2-microglobulin

Chain B: 6% 80% 19%




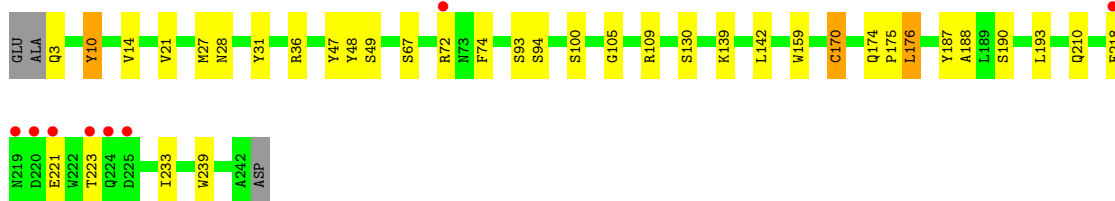
- Molecule 4: TCR F50 alpha chain

Chain I: 4% 80% 16%



- Molecule 5: TCR F50 beta chain

Chain J:  3% 84% 14% ..



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	66.27Å 71.05Å 100.69Å 90.00° 96.22° 90.00°	Depositor
Resolution (Å)	37.92 – 1.70 37.92 – 1.70	Depositor EDS
% Data completeness (in resolution range)	98.1 (37.92-1.70) 98.1 (37.92-1.70)	Depositor EDS
R_{merge}	0.35	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.33 (at 1.70Å)	Xtrriage
Refinement program	PHENIX 1.9_1692	Depositor
R, R_{free}	0.190 , 0.224 0.192 , 0.223	Depositor DCC
R_{free} test set	2000 reflections (1.99%)	wwPDB-VP
Wilson B-factor (Å ²)	20.3	Xtrriage
Anisotropy	0.343	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.33 , 41.8	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	7466	wwPDB-VP
Average B, all atoms (Å ²)	25.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.75% 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	C	2.24	2/69 (2.9%)	0.89	0/90
2	A	2.06	37/2311 (1.6%)	0.90	1/3137 (0.0%)
3	B	2.06	15/857 (1.8%)	0.92	2/1159 (0.2%)
4	I	2.04	21/1619 (1.3%)	0.95	4/2195 (0.2%)
5	J	2.08	25/1980 (1.3%)	0.88	2/2696 (0.1%)
All	All	2.06	100/6836 (1.5%)	0.91	9/9277 (0.1%)

The worst 5 of 100 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	J	36	ARG	CB-CG	-10.82	1.23	1.52
4	I	14	VAL	CB-CG1	-9.31	1.33	1.52
2	A	135	ALA	CA-CB	-9.00	1.33	1.52
2	A	275	GLU	CG-CD	-8.55	1.39	1.51
2	A	27	TYR	CD2-CE2	-8.48	1.26	1.39

The worst 5 of 9 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	I	62	ARG	NE-CZ-NH2	-11.08	114.76	120.30
4	I	62	ARG	NE-CZ-NH1	10.65	125.62	120.30
3	B	81	ARG	NE-CZ-NH2	-9.21	115.70	120.30
3	B	81	ARG	NE-CZ-NH1	8.91	124.76	120.30
5	J	176	LEU	CA-CB-CG	7.61	132.81	115.30

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	C	68	0	75	0	0
2	A	2246	0	2096	31	0
3	B	834	0	799	6	0
4	I	1586	0	1523	27	0
5	J	1927	0	1849	18	0
6	A	246	0	0	12	2
6	B	125	0	0	3	1
6	C	4	0	0	0	0
6	I	187	0	0	7	3
6	J	243	0	0	3	0
All	All	7466	0	6342	70	3

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 5.

The worst 5 of 70 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)
2:A:58:GLU:HG2	6:A:359:HOH:O	1.44	1.18
2:A:35:ARG:NH1	6:A:301:HOH:O	2.00	0.95
2:A:75:ARG:NH1	6:A:302:HOH:O	2.08	0.86
4:I:156:ASP:OD2	4:I:183:LYS:NZ	2.11	0.83
4:I:154:ASP:OD2	6:I:301:HOH:O	1.97	0.83

All (3) 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)
6:A:528:HOH:O	6:I:377:HOH:O[1_455]	2.07	0.13
6:B:194:HOH:O	6:I:453:HOH:O[1_455]	2.12	0.08
6:A:454:HOH:O	6:I:471:HOH:O[2_8411]	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	C	7/9 (78%)	6 (86%)	1 (14%)	0	100	100
2	A	273/275 (99%)	267 (98%)	6 (2%)	0	100	100
3	B	98/100 (98%)	96 (98%)	2 (2%)	0	100	100
4	I	200/208 (96%)	195 (98%)	5 (2%)	0	100	100
5	J	238/243 (98%)	234 (98%)	4 (2%)	0	100	100
All	All	816/835 (98%)	798 (98%)	18 (2%)	0	100	100

There are no Ramachandran outliers to report.

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	C	7/7 (100%)	7 (100%)	0	100	100
2	A	231/231 (100%)	231 (100%)	0	100	100
3	B	94/94 (100%)	93 (99%)	1 (1%)	73	63
4	I	182/187 (97%)	180 (99%)	2 (1%)	73	63
5	J	213/215 (99%)	211 (99%)	2 (1%)	78	70
All	All	727/734 (99%)	722 (99%)	5 (1%)	84	77

All (5) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
3	B	1	ILE
4	I	10	SER
4	I	203	PHE
5	J	142	LEU
5	J	218	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
2	A	145	HIS
2	A	188	HIS
3	B	13	HIS
4	I	119	ASN
4	I	182	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 monosaccharides 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	C	9/9 (100%)	0.53	0 100 100	15, 17, 20, 22	0
2	A	275/275 (100%)	0.32	15 (5%) 25 27	14, 23, 40, 50	0
3	B	100/100 (100%)	0.37	6 (6%) 21 24	15, 22, 42, 47	0
4	I	202/208 (97%)	0.24	8 (3%) 38 42	14, 21, 39, 59	0
5	J	240/243 (98%)	0.07	8 (3%) 46 51	15, 21, 35, 56	0
All	All	826/835 (98%)	0.24	37 (4%) 33 37	14, 22, 39, 59	0

The worst 5 of 37 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
4	I	133	SER	7.9
2	A	194	VAL	6.1
5	J	223	THR	5.5
4	I	134	ASP	4.6
5	J	218	GLU	4.4

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 monosaccharides 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.