



# Full wwPDB X-ray Structure Validation Report ⓘ

Feb 27, 2014 – 09:02 AM GMT

PDB ID : 3MRR  
Title : Crystal Structure of MHC class I HLA-A2 molecule complexed with Human Prostaglandin Transporter decapeptide  
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Deposited on : 2010-04-29  
Resolution : 1.60 Å(reported)

This is a full wwPDB 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 <http://wwpdb.org/ValidationPDFNotes.html>

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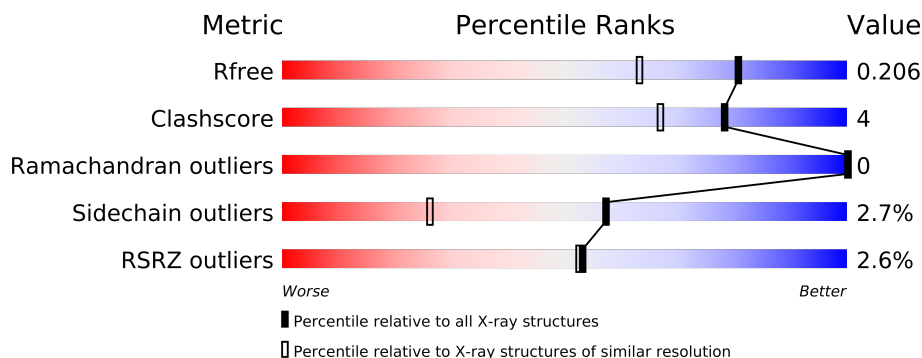
The following versions of software and data (see [references](#)) were used in the production of this report:

MolProbity : 4.02b-467  
Mogul : 1.15 2013  
Xtriage (Phenix) : dev-1323  
EDS : stable22639  
Percentile statistics : 21963  
Refmac : 5.8.0049  
CCP4 : 6.3.0 (Settle)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et. al. (1996)  
Validation Pipeline (wwPDB-VP) : stable22683

# 1 Overall quality at a glance

The reported resolution of this entry is 1.60 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))
$R_{free}$	66092	1872 (1.60-1.60)
Clashscore	79885	2199 (1.60-1.60)
Ramachandran outliers	78287	2126 (1.60-1.60)
Sidechain outliers	78261	2125 (1.60-1.60)
RSRZ outliers	66119	1872 (1.60-1.60)

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. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density.

Mol	Chain	Length	Quality of chain
1	A	293	
2	B	100	
3	P	10	

## 2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 3478 atoms, of which 0 are hydrogen and 0 are deuterium.

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 HLA class I histocompatibility antigen, A-2 alpha chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	275	Total	C	N	O	S	0	10	0
			2300	1443	417	431	9			

There are 18 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	245	VAL	ALA	ENGINEERED MUTATION	UNP P01892
A	277	GLY	-	EXPRESSION TAG	UNP P01892
A	278	SER	-	EXPRESSION TAG	UNP P01892
A	279	LEU	-	EXPRESSION TAG	UNP P01892
A	280	HIS	-	EXPRESSION TAG	UNP P01892
A	281	HIS	-	EXPRESSION TAG	UNP P01892
A	282	ILE	-	EXPRESSION TAG	UNP P01892
A	283	LEU	-	EXPRESSION TAG	UNP P01892
A	284	ASP	-	EXPRESSION TAG	UNP P01892
A	285	ALA	-	EXPRESSION TAG	UNP P01892
A	286	GLN	-	EXPRESSION TAG	UNP P01892
A	287	LYS	-	EXPRESSION TAG	UNP P01892
A	288	MET	-	EXPRESSION TAG	UNP P01892
A	289	VAL	-	EXPRESSION TAG	UNP P01892
A	290	TRP	-	EXPRESSION TAG	UNP P01892
A	291	ASN	-	EXPRESSION TAG	UNP P01892
A	292	HIS	-	EXPRESSION TAG	UNP P01892
A	293	ARG	-	EXPRESSION TAG	UNP P01892

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

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	100	Total	C	N	O	S	0	5	0
			859	549	144	162	4			

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	0	MET	-	EXPRESSION TAG	UNP P61769

- Molecule 3 is a protein called 10-meric peptide from Solute carrier organic anion transporter family member 2A1.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
3	P	10	Total	C	N	O	0	0	0
			67	45	10	12			

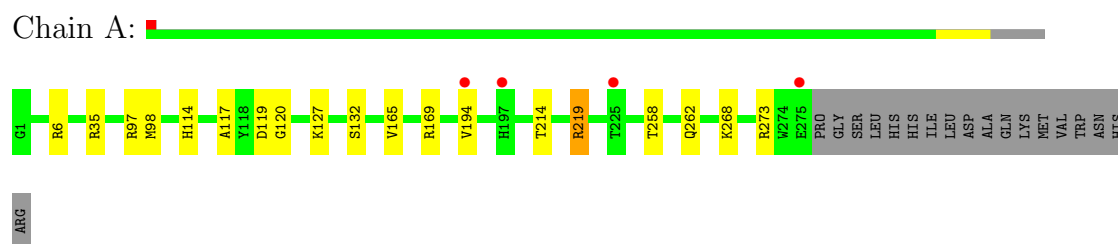
- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	182	Total	O	0	0
			182	182		
4	B	65	Total	O	0	0
			65	65		
4	P	5	Total	O	0	0
			5	5		

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



- Molecule 2: Beta-2-microglobulin



- Molecule 3: 10-meric peptide from Solute carrier organic anion transporter family member 2A1



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	53.89Å 81.04Å 57.51Å 90.00° 114.66° 90.00°	Depositor
Resolution (Å)	14.89 – 1.60 46.78 – 1.60	Depositor EDS
% Data completeness (in resolution range)	93.8 (14.89-1.60) 93.8 (46.78-1.60)	Depositor EDS
$R_{merge}$	0.03	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.52 (at 1.60Å)	Xtriage
Refinement program	REFMAC 5.5.0088	Depositor
R, $R_{free}$	0.192 , 0.224 0.200 , 0.206	Depositor DCC
$R_{free}$ test set	5577 reflections (11.16%)	DCC
Wilson B-factor (Å <sup>2</sup> )	23.6	Xtriage
Anisotropy	0.083	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.35 , 39.8	EDS
Estimated twinning fraction	No twinning to report.	Xtriage
L-test for twinning	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtriage
Outliers	0 of 55551 reflections	Xtriage
$F_o, F_c$ correlation	0.96	EDS
Total number of atoms	3478	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	33.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.40% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

## 5 Model quality

### 5.1 Standard geometry

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	0.47	0/2395	0.63	0/3250
2	B	0.48	0/897	0.58	0/1213
3	P	0.43	0/67	0.62	0/90
All	All	0.47	0/3359	0.62	0/4553

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

### 5.2 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 hydrogens added by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, and the number in parentheses is this value normalized per 1000 atoms of the molecule in the chain. The Symm-Clashes column gives symmetry related clashes, in the same way as for the Clashes column.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	2300	0	2188	15	0
2	B	859	0	842	11	0
3	P	67	0	80	0	0
4	A	182	0	0	2	0
4	B	65	0	0	0	0
4	P	5	0	0	0	0
All	All	3478	0	3110	23	0

Clashscore is defined as the number of clashes calculated for the entry per 1000 atoms (including hydrogens) of the entry. The overall clashscore for this entry is 4.

All (23) close contacts within the same asymmetric unit are listed below.

Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:A:258:THR:HG22	1:A:273:ARG:HG2	1.68	0.75
1:A:165[B]:VAL:HG12	1:A:169[B]:ARG:NH1	2.13	0.64
1:A:120:GLY:HA3	2:B:1:ILE:HD11	1.81	0.62
2:B:9[B]:VAL:HG11	2:B:80:CYS:HB3	1.90	0.53
1:A:165[B]:VAL:CG1	1:A:169[B]:ARG:NH1	2.73	0.51
1:A:117:ALA:HB2	2:B:60:TRP:CE2	2.46	0.50
2:B:9[B]:VAL:HG11	2:B:80:CYS:CB	2.42	0.50
2:B:2:GLN:HB3	2:B:86:THR:HG22	1.93	0.50
1:A:219:ARG:HB3	1:A:219:ARG:NH1	2.27	0.49
2:B:1:ILE:CD1	2:B:3[A]:ARG:HH21	2.25	0.49
1:A:119:ASP:O	2:B:1:ILE:HG12	2.15	0.47
1:A:219:ARG:HB3	1:A:219:ARG:HH11	1.80	0.46
1:A:97:ARG:HH21	1:A:114:HIS:CE1	2.35	0.45
2:B:9[B]:VAL:CG1	2:B:80:CYS:HB3	2.47	0.44
2:B:1:ILE:HG13	2:B:1:ILE:O	2.17	0.44
1:A:6[A]:ARG:HD2	1:A:98:MET:SD	2.58	0.43
2:B:9[B]:VAL:CG1	2:B:80:CYS:CB	2.97	0.42
1:A:219:ARG:HD3	4:A:424:HOH:O	2.19	0.42
1:A:127[A]:LYS:HD2	1:A:132:SER:OG	2.20	0.42
2:B:0:MET:HB2	2:B:0:MET:HE2	1.94	0.41
1:A:214[B]:THR:OG1	1:A:262:GLN:HB2	2.22	0.40
1:A:127[A]:LYS:HE2	4:A:425:HOH:O	2.22	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	A	283/293 (97%)	280 (99%)	3 (1%)	0	100	100
2	B	103/100 (103%)	102 (99%)	1 (1%)	0	100	100
3	P	8/10 (80%)	8 (100%)	0	0	100	100
All	All	394/403 (98%)	390 (99%)	4 (1%)	0	100	100

There are no Ramachandran outliers to report.



### 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	A	242/248 (98%)	238 (98%)	4 (2%)	73	47
2	B	100/95 (105%)	95 (95%)	5 (5%)	34	9
3	P	7/7 (100%)	7 (100%)	0	100	100
All	All	349/350 (100%)	340 (97%)	9 (3%)	57	28

All (9) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	35	ARG
1	A	194	VAL
1	A	219	ARG
1	A	268	LYS
2	B	58	LYS
2	B	70	PHE
2	B	83	ASN
2	B	97	ARG
2	B	98	ASP

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

Mol	Chain	Res	Type
1	A	32	GLN
1	A	114	HIS
1	A	260	HIS
2	B	51	HIS
2	B	83	ASN

### 5.3.3 RNA ⓘ

There are no RNA chains in this entry.

## 5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

There are no non-standard protein/DNA/RNA residues in this entry.

## 5.5 Carbohydrates ⓘ

There are no carbohydrates in this entry.

## 5.6 Ligand geometry ⓘ

There are no ligands in this entry.

## 5.7 Other polymers ⓘ

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	A	275/293 (93%)	-0.19	4 (1%) 70 71	20, 30, 45, 56	16 (5%)
2	B	100/100 (100%)	-0.01	4 (4%) 36 35	22, 33, 48, 63	11 (11%)
3	P	10/10 (100%)	0.62	2 (20%) 2 1	28, 34, 50, 50	0
All	All	385/403 (95%)	-0.12	10 (2%) 53 52	20, 31, 47, 63	27 (7%)

All (10) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	B	0	MET	6.2
1	A	194	VAL	5.1
2	B	1	ILE	4.3
2	B	99	MET	2.9
1	A	197	HIS	2.9
1	A	225	THR	2.9
3	P	7	THR	2.5
3	P	6	GLY	2.3
1	A	275	GLU	2.1
2	B	98	ASP	2.1

### 6.2 Non-standard residues in protein, DNA, RNA chains ⓘ

There are no non-standard protein/DNA/RNA residues in this entry.

### 6.3 Carbohydrates ⓘ

There are no carbohydrates in this entry.

## 6.4 Ligands

There are no ligands in this entry.

## 6.5 Other polymers

There are no such residues in this entry.