



# Full wwPDB X-ray Structure Validation Report ⓘ

Mar 13, 2018 – 08:05 pm GMT

PDB ID : 1Z92  
Title : structure of interleukin-2 with its alpha receptor  
Authors : Rickert, M.; Wang, X.Q.; Goriatcheva, N.; Boulanger, M.J.; Garcia, K.C.  
Deposited on : 2005-03-31  
Resolution : 2.80 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 : trunk31020  
Percentile statistics : 20171227.v01 (using entries in the PDB archive December 27th 2017)  
Refmac : 5.8.0158  
CCP4 : 7.0 (Gargrove)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : trunk31020

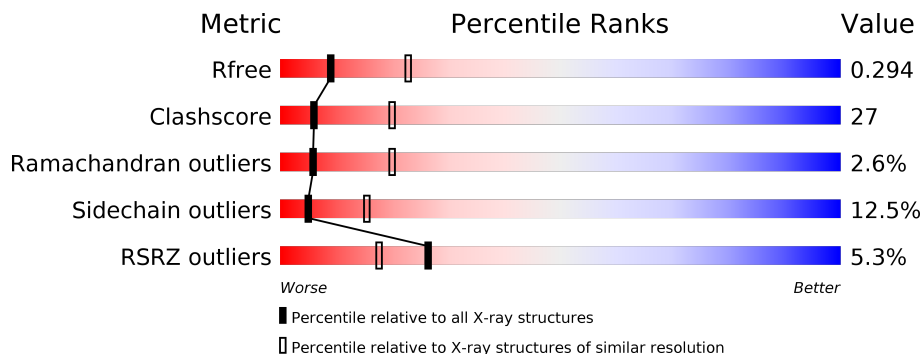
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.80 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))
$R_{free}$	111664	2792 (2.80-2.80)
Clashscore	122126	3209 (2.80-2.80)
Ramachandran outliers	120053	3158 (2.80-2.80)
Sidechain outliers	120020	3160 (2.80-2.80)
RSRZ outliers	108989	2726 (2.80-2.80)

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. 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	133	
2	B	219	

## 2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 1971 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 Interleukin-2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	121	989	636	161	185	7	0	0	0

- Molecule 2 is a protein called Interleukin-2 receptor alpha chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	123	982	610	174	183	15	0	0	0

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	-1	ASP	-	CLONING ARTIFACT	UNP P01589
B	0	PRO	-	CLONING ARTIFACT	UNP P01589



## 4 Data and refinement statistics i

Property	Value	Source
Space group	P 32 2 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	85.46Å 85.46Å 114.33Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	50.00 – 2.80 40.03 – 2.60	Depositor EDS
% Data completeness (in resolution range)	(Not available) (50.00-2.80) 87.3 (40.03-2.60)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.04 (at 2.61Å)	Xtrriage
Refinement program	CNS 1.0	Depositor
R, $R_{free}$	0.233 , 0.280 0.245 , 0.294	Depositor DCC
$R_{free}$ test set	1263 reflections (8.48%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	73.9	Xtrriage
Anisotropy	0.317	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.38 , 65.2	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	0.039 for -h,-k,l	Xtrriage
$F_o, F_c$ correlation	0.93	EDS
Total number of atoms	1971	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	80.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.26% 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	0.43	0/1003	0.66	0/1352
2	B	0.45	0/1007	0.75	0/1360
All	All	0.44	0/2010	0.70	0/2712

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	A	989	0	1026	61	0
2	B	982	0	924	54	0
All	All	1971	0	1950	104	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 27.

All (104) 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:54:LYS:HB2	1:A:102:THR:HG22	1.47	0.94
2:B:26:LEU:HD11	2:B:117:ARG:HB3	1.49	0.92

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:136:ARG:HD3	2:B:137:ALA:H	1.33	0.90
1:A:107:TYR:HB2	2:B:35:ARG:HH22	1.41	0.85
2:B:136:ARG:HD3	2:B:137:ALA:N	1.98	0.79
2:B:115:THR:O	2:B:116:GLU:HB2	1.82	0.79
1:A:50:ALA:HA	1:A:55:HIS:ND1	1.98	0.78
2:B:10:ILE:HD11	2:B:159:PRO:HG2	1.65	0.78
1:A:107:TYR:HB2	2:B:35:ARG:NH2	1.98	0.77
2:B:31:LYS:HG2	2:B:32:ARG:H	1.50	0.77
2:B:62:THR:HG22	2:B:63:SER:H	1.47	0.76
1:A:45:TYR:CE1	1:A:111:THR:HG22	2.23	0.74
1:A:54:LYS:HB2	1:A:102:THR:CG2	2.17	0.73
1:A:105:CYS:C	1:A:107:TYR:H	1.91	0.71
1:A:38:ARG:NH2	2:B:6:ASP:OD1	2.24	0.70
2:B:21:LYS:O	2:B:24:THR:HG23	1.92	0.70
1:A:124:PHE:O	1:A:128:ILE:HG12	1.92	0.69
2:B:141:GLY:HA3	2:B:160:GLN:HB2	1.73	0.68
1:A:48:LYS:H	1:A:48:LYS:CD	2.07	0.67
1:A:6:SER:HB3	1:A:9:LYS:HG2	1.78	0.66
2:B:31:LYS:HG2	2:B:32:ARG:N	2.10	0.66
1:A:33:ASN:HD21	1:A:39:MET:CE	2.10	0.65
1:A:59:LEU:HD13	1:A:121:TRP:CD1	2.34	0.63
1:A:128:ILE:O	1:A:132:LEU:HD22	1.99	0.63
1:A:48:LYS:HG3	1:A:108:ALA:HA	1.81	0.62
1:A:38:ARG:HD3	2:B:120:HIS:ND1	2.14	0.62
1:A:44:PHE:HE2	1:A:69:VAL:HG21	1.65	0.62
1:A:57:GLN:HG3	1:A:102:THR:H	1.64	0.61
1:A:44:PHE:CE2	1:A:69:VAL:HG21	2.36	0.60
1:A:62:GLU:C	1:A:65:PRO:HD2	2.23	0.59
2:B:150:THR:HG21	2:B:155:ARG:HE	1.67	0.59
1:A:61:GLU:OE1	1:A:105:CYS:HB2	2.03	0.58
2:B:26:LEU:CD1	2:B:117:ARG:HB3	2.28	0.58
1:A:105:CYS:C	1:A:107:TYR:N	2.56	0.58
1:A:33:ASN:HD21	1:A:39:MET:HE2	1.69	0.57
2:B:112:ASN:HD21	2:B:117:ARG:HH21	1.51	0.57
1:A:13:GLN:HB2	1:A:96:LEU:HD21	1.87	0.57
1:A:48:LYS:H	1:A:48:LYS:HD2	1.72	0.55
1:A:44:PHE:HB2	1:A:112:ALA:O	2.06	0.55
1:A:131:THR:O	1:A:133:THR:N	2.33	0.55
2:B:10:ILE:HB	2:B:13:ALA:HB3	1.87	0.55
1:A:57:GLN:O	1:A:61:GLU:HG3	2.06	0.55
2:B:150:THR:CG2	2:B:155:ARG:HE	2.19	0.54

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:34:PRO:HB2	2:B:4:ASP:CG	2.27	0.54
1:A:131:THR:C	1:A:133:THR:H	2.10	0.53
2:B:147:CYS:HB2	2:B:156:TRP:CE2	2.43	0.53
1:A:42:PHE:CE1	2:B:43:TYR:HD2	2.27	0.53
1:A:47:PRO:HG3	1:A:58:CYS:SG	2.50	0.52
1:A:48:LYS:HD2	1:A:48:LYS:N	2.25	0.52
1:A:64:LYS:N	1:A:65:PRO:CD	2.72	0.52
1:A:45:TYR:CZ	2:B:35:ARG:HB2	2.45	0.51
2:B:62:THR:HG22	2:B:63:SER:N	2.20	0.51
1:A:38:ARG:NH1	2:B:120:HIS:ND1	2.58	0.51
2:B:141:GLY:O	2:B:142:PRO:C	2.48	0.50
1:A:112:ALA:HB1	1:A:116:GLU:HB2	1.94	0.50
1:A:35:LYS:O	1:A:38:ARG:HB2	2.12	0.50
1:A:81:ARG:HG3	1:A:81:ARG:HH11	1.78	0.49
1:A:55:HIS:C	1:A:57:GLN:H	2.15	0.48
2:B:149:MET:HA	2:B:154:THR:HA	1.95	0.48
1:A:45:TYR:HE2	2:B:36:ARG:HG2	1.77	0.48
1:A:62:GLU:OE2	2:B:36:ARG:NH2	2.47	0.48
2:B:140:ARG:C	2:B:141:GLY:O	2.52	0.48
2:B:123:VAL:HA	2:B:147:CYS:SG	2.55	0.47
2:B:8:PRO:HD3	2:B:156:TRP:CB	2.44	0.47
2:B:161:LEU:HD11	2:B:163:CYS:SG	2.55	0.47
2:B:150:THR:HG21	2:B:155:ARG:HH21	1.79	0.47
2:B:126:MET:HA	2:B:145:SER:O	2.15	0.46
2:B:112:ASN:ND2	2:B:117:ARG:HH21	2.13	0.46
1:A:57:GLN:HG3	1:A:102:THR:N	2.31	0.46
1:A:107:TYR:CB	2:B:35:ARG:HH22	2.19	0.46
1:A:24:ILE:HG23	1:A:70:LEU:HD21	1.98	0.45
2:B:144:GLU:N	2:B:144:GLU:OE2	2.50	0.45
1:A:85:LEU:O	1:A:89:ILE:HG13	2.16	0.45
1:A:25:LEU:HD21	1:A:119:ASN:ND2	2.31	0.45
2:B:136:ARG:HH11	2:B:136:ARG:HG2	1.82	0.44
1:A:18:LEU:HD22	1:A:126:GLN:HG2	1.99	0.44
2:B:116:GLU:HG3	2:B:117:ARG:H	1.81	0.44
1:A:131:THR:C	1:A:133:THR:N	2.71	0.44
2:B:22:GLU:OE1	2:B:22:GLU:O	2.35	0.44
1:A:51:THR:H	1:A:55:HIS:CE1	2.35	0.44
2:B:141:GLY:CA	2:B:160:GLN:HB2	2.46	0.44
2:B:35:ARG:HH11	2:B:35:ARG:HG3	1.83	0.43
2:B:113:GLU:OE1	2:B:116:GLU:O	2.36	0.43
2:B:25:MET:HG2	2:B:45:LEU:HD12	2.00	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:55:TRP:CD1	2:B:107:PRO:HB3	2.54	0.43
1:A:9:LYS:O	1:A:13:GLN:HG3	2.19	0.43
2:B:18:MET:HG2	2:B:128:TYR:CE1	2.54	0.42
1:A:44:PHE:O	1:A:112:ALA:N	2.52	0.42
1:A:55:HIS:C	1:A:57:GLN:N	2.72	0.42
2:B:116:GLU:CG	2:B:117:ARG:H	2.33	0.42
2:B:161:LEU:HD13	2:B:162:ILE:N	2.35	0.42
2:B:7:PRO:O	2:B:8:PRO:C	2.57	0.42
1:A:33:ASN:ND2	1:A:39:MET:CE	2.80	0.42
2:B:15:PHE:HA	2:B:128:TYR:O	2.20	0.42
1:A:119:ASN:HD22	1:A:119:ASN:HA	1.64	0.42
1:A:18:LEU:HD12	1:A:18:LEU:C	2.41	0.41
1:A:24:ILE:HD11	1:A:85:LEU:HD13	2.01	0.41
2:B:-1:ASP:HA	2:B:0:PRO:HD2	1.88	0.41
1:A:22:GLN:HG3	1:A:122:ILE:HD13	2.02	0.41
1:A:47:PRO:HB2	1:A:50:ALA:HB2	2.02	0.41
1:A:48:LYS:HD2	1:A:49:LYS:H	1.86	0.41
2:B:161:LEU:CD1	2:B:163:CYS:SG	3.09	0.40
1:A:67:GLU:HG3	1:A:86:ILE:HG13	2.04	0.40
2:B:110:TRP:C	2:B:112:ASN:H	2.25	0.40

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	117/133 (88%)	107 (92%)	8 (7%)	2 (2%)	10	32
2	B	117/219 (53%)	101 (86%)	12 (10%)	4 (3%)	4	14
All	All	234/352 (66%)	208 (89%)	20 (8%)	6 (3%)	6	20

All (6) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	B	112	ASN
2	B	116	GLU
1	A	132	LEU
2	B	22	GLU
2	B	151	HIS
1	A	107	TYR

### 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	115/126 (91%)	98 (85%)	17 (15%)	3	10
2	B	109/196 (56%)	98 (90%)	11 (10%)	8	24
All	All	224/322 (70%)	196 (88%)	28 (12%)	5	15

All (28) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	18	LEU
1	A	37	THR
1	A	48	LYS
1	A	49	LYS
1	A	57	GLN
1	A	64	LYS
1	A	83	ARG
1	A	85	LEU
1	A	87	SER
1	A	97	LYS
1	A	100	GLU
1	A	106	GLU
1	A	110	GLU
1	A	114	ILE
1	A	120	ARG
1	A	132	LEU
1	A	133	THR
2	B	1	GLU

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Mol	Chain	Res	Type
2	B	22	GLU
2	B	35	ARG
2	B	41	SER
2	B	56	ASP
2	B	105	ARG
2	B	112	ASN
2	B	123	VAL
2	B	140	ARG
2	B	147	CYS
2	B	164	THR

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (7) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	33	ASN
1	A	71	ASN
1	A	88	ASN
1	A	119	ASN
2	B	57	ASN
2	B	112	ASN
2	B	158	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](#)

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 [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	121/133 (90%)	0.36	5 (4%) 37 27	48, 69, 112, 148	0
2	B	123/219 (56%)	0.31	8 (6%) 19 11	54, 84, 118, 142	0
All	All	244/352 (69%)	0.33	13 (5%) 26 17	48, 77, 118, 148	0

All (13) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	109	ASP	4.5
1	A	110	GLU	4.1
2	B	164	THR	3.5
2	B	115	THR	3.4
2	B	151	HIS	3.3
2	B	58	GLN	3.0
1	A	104	MET	2.9
2	B	22	GLU	2.6
2	B	31	LYS	2.4
1	A	102	THR	2.3
1	A	107	TYR	2.1
2	B	138	LEU	2.1
2	B	47	THR	2.1

### 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

There are no ligands in this entry.

## 6.5 Other polymers

There are no such residues in this entry.