



# wwPDB X-ray Structure Validation Summary Report ⓘ

Nov 6, 2023 – 11:40 PM EST

PDB ID : 3U51  
Title : Src in complex with DNA-templated macrocyclic inhibitor MC1  
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Deposited on : 2011-10-10  
Resolution : 2.24 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](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.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

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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 : 1.8.5 (274361), CSD as541be (2020)  
Xtriage (Phenix) : 1.13  
EDS : 2.36  
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) : 2.36

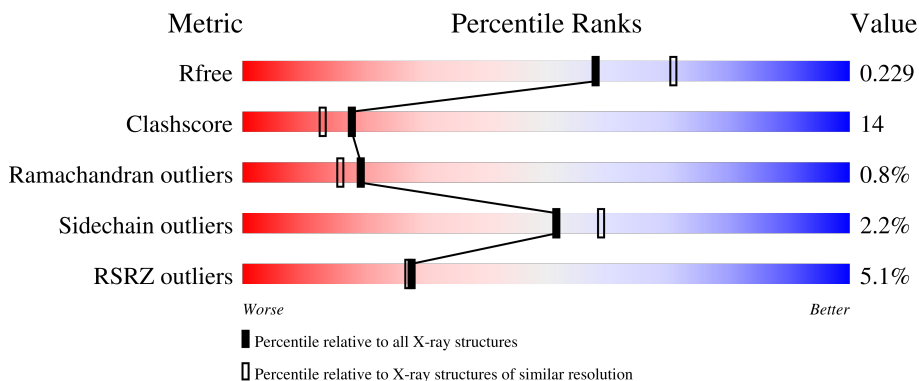
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.24 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	2391 (2.26-2.22)
Clashscore	141614	2539 (2.26-2.22)
Ramachandran outliers	138981	2489 (2.26-2.22)
Sidechain outliers	138945	2490 (2.26-2.22)
RSRZ outliers	127900	2353 (2.26-2.22)

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  $\geq 3$ , 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	A	275	 5% 66% 27% 7%
1	B	275	 4% 66% 24% 7%
2	C	6	 17% 33% 50%
2	D	6	 50% 50%

## 2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 4337 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 Proto-oncogene tyrosine-protein kinase Src.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	256	2059	1321	343	378	17	0	0	0
1	B	255	2048	1312	342	377	17	0	0	0

- Molecule 2 is a protein called macrocyclic inhibitor MC1.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
			Total	C	N	O			
2	C	6	54	38	9	7	0	0	1
2	D	6	54	38	9	7	0	0	1

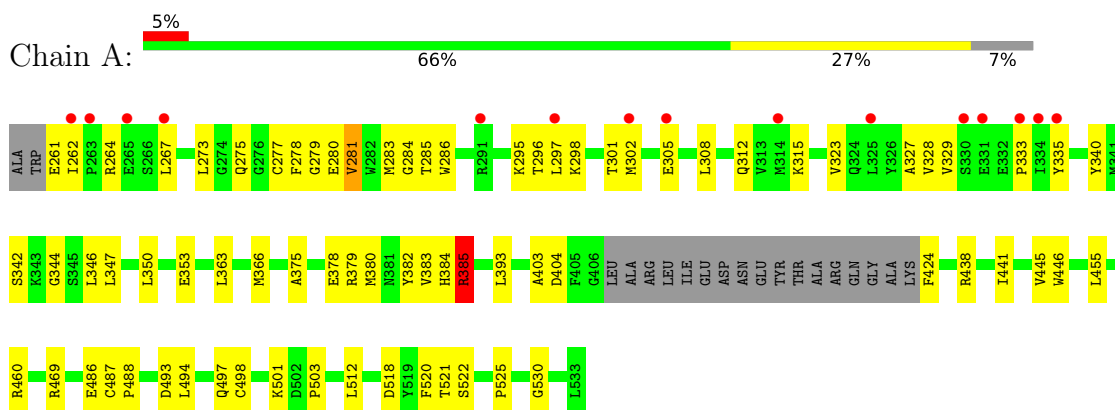
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	59	Total	O	0	0
			59	59		
3	B	61	Total	O	0	0
			61	61		
3	C	2	Total	O	0	0
			2	2		

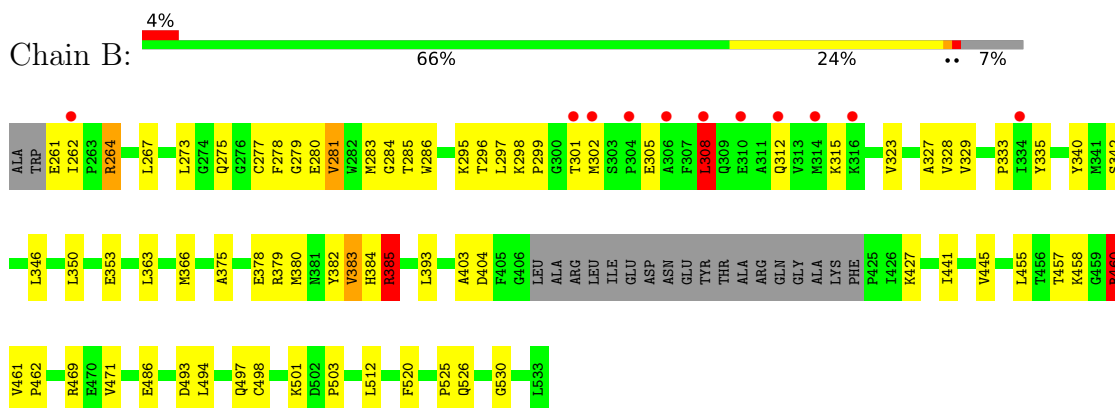
### 3 Residue-property plots

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.

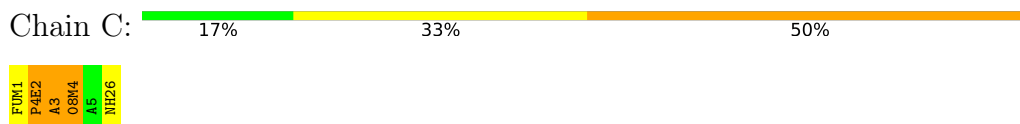
- Molecule 1: Proto-oncogene tyrosine-protein kinase Src



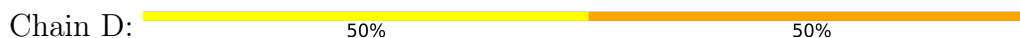
- Molecule 1: Proto-oncogene tyrosine-protein kinase Src



- Molecule 2: macrocyclic inhibitor MC1



- Molecule 2: macrocyclic inhibitor MC1



F0M1  
P4E2  
A3  
O8M4  
A5  
MH26

## 4 Data and refinement statistics i

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	42.17Å 117.25Å 62.76Å 90.00° 90.08° 90.00°	Depositor
Resolution (Å)	34.98 – 2.24 34.98 – 2.24	Depositor EDS
% Data completeness (in resolution range)	94.9 (34.98-2.24) 90.8 (34.98-2.24)	Depositor EDS
$R_{merge}$	0.07	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.88 (at 2.24Å)	Xtrriage
Refinement program	PHENIX 1.6_289	Depositor
R, $R_{free}$	0.199 , 0.236 0.188 , 0.229	Depositor DCC
$R_{free}$ test set	2021 reflections (7.28%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	33.8	Xtrriage
Anisotropy	0.962	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.34 , 35.4	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.44$ , $\langle L^2 \rangle = 0.27$	Xtrriage
Estimated twinning fraction	0.390 for h,-k,-l	Xtrriage
Reported twinning fraction	0.382 for h,-k,-l	Depositor
Outliers	0 of 27767 reflections	Xtrriage
$F_o, F_c$ correlation	0.96	EDS
Total number of atoms	4337	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	52.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.70% 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](#)

Bond lengths and bond angles in the following residue types are not validated in this section: FUM, P4E, DAB, NH2, ALC, 08M

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	0.26	0/2109	0.71	9/2854 (0.3%)
1	B	0.27	0/2097	0.74	10/2837 (0.4%)
All	All	0.27	0/4206	0.73	19/5691 (0.3%)

There are no bond length outliers.

The worst 5 of 19 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	460	ARG	NE-CZ-NH2	-13.19	113.71	120.30
1	B	264	ARG	NE-CZ-NH1	-12.85	113.87	120.30
1	B	460	ARG	NE-CZ-NH1	12.75	126.67	120.30
1	A	264	ARG	NE-CZ-NH2	-12.70	113.95	120.30
1	B	264	ARG	NE-CZ-NH2	12.43	126.52	120.30

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	A	2059	0	2046	56	0
1	B	2048	0	2038	52	0
2	C	54	0	35	9	0
2	D	54	0	36	8	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	A	59	0	0	3	0
3	B	61	0	0	2	0
3	C	2	0	0	0	0
All	All	4337	0	4155	113	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 14.

The worst 5 of 113 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:D:2:P4E:C	2:D:3:ALC:HD22	2.15	0.76
1:A:424:PHE:HA	2:C:2:P4E:H01	1.68	0.74
2:D:4:08M:O	2:D:5:DAB:HB3	1.87	0.74
1:B:281:VAL:HG23	1:B:295:LYS:HG2	1.70	0.73
1:B:278:PHE:HD2	1:B:301:THR:HB	1.54	0.72

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	252/275 (92%)	242 (96%)	8 (3%)	2 (1%)	19	16
1	B	251/275 (91%)	242 (96%)	7 (3%)	2 (1%)	19	16
All	All	503/550 (92%)	484 (96%)	15 (3%)	4 (1%)	19	16

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	385	ARG

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Mol	Chain	Res	Type
1	B	385	ARG
1	A	404	ASP
1	B	404	ASP

### 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	223/237 (94%)	219 (98%)	4 (2%)	59	66
1	B	222/237 (94%)	216 (97%)	6 (3%)	44	51
All	All	445/474 (94%)	435 (98%)	10 (2%)	52	59

5 of 10 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	383	VAL
1	B	460	ARG
1	B	469	ARG
1	A	469	ARG
1	B	281	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

### 5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

8 non-standard protein/DNA/RNA residues are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The

Link column lists molecule types, if any, to which the group is linked. 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  $|Z| > 2$  is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
2	ALC	D	3	2	9,11,12	0.46	0	10,13,15	1.37	2 (20%)
2	08M	C	4	2	15,16,17	1.51	1 (6%)	14,19,21	1.61	3 (21%)
2	08M	D	4	2	15,16,17	1.50	1 (6%)	14,19,21	1.44	3 (21%)
2	DAB	C	5	2	5,6,7	0.29	0	1,6,8	1.02	0
2	P4E	D	2	2	12,13,14	1.16	1 (8%)	11,15,17	1.50	3 (27%)
2	P4E	C	2	2	12,13,14	1.15	1 (8%)	11,15,17	1.56	2 (18%)
2	ALC	C	3	2	9,11,12	0.45	0	10,13,15	1.21	1 (10%)
2	DAB	D	5	2	5,6,7	0.24	0	1,6,8	0.07	0

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	ALC	D	3	2	-	4/5/14/16	0/1/1/1
2	08M	C	4	2	-	6/12/13/15	0/1/1/1
2	08M	D	4	2	-	4/12/13/15	0/1/1/1
2	DAB	C	5	2	-	1/4/5/7	-
2	P4E	D	2	2	-	5/7/8/10	0/1/1/1
2	P4E	C	2	2	-	6/7/8/10	0/1/1/1
2	ALC	C	3	2	-	2/5/14/16	0/1/1/1
2	DAB	D	5	2	-	0/4/5/7	-

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	C	4	08M	C35-N34	5.45	1.45	1.33
2	D	4	08M	C35-N34	5.35	1.45	1.33
2	C	2	P4E	C07-C08	2.70	1.40	1.31
2	D	2	P4E	C07-C08	2.63	1.40	1.31

The worst 5 of 14 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	2	P4E	C09-C08-C07	-3.88	118.74	124.34
2	C	4	08M	C37-C35-N34	3.59	120.61	115.59
2	D	2	P4E	C04-C07-C08	-3.13	119.17	126.99
2	D	3	ALC	CG-CB-CA	-2.91	110.61	114.52
2	C	3	ALC	CG-CB-CA	-2.88	110.65	114.52

There are no chirality outliers.

5 of 28 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	C	3	ALC	N-CA-CB-CG
2	C	3	ALC	C-CA-CB-CG
2	D	3	ALC	N-CA-CB-CG
2	D	3	ALC	C-CA-CB-CG
2	C	2	P4E	C04-C07-C08-C09

There are no ring outliers.

7 monomers are involved in 14 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	D	3	ALC	3	0
2	C	4	08M	4	0
2	D	4	08M	2	0
2	D	2	P4E	5	0
2	C	2	P4E	1	0
2	C	3	ALC	2	0
2	D	5	DAB	2	0

## 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

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	256/275 (93%)	0.28	15 (5%) 22 21	24, 46, 93, 117	0
1	B	255/275 (92%)	0.26	11 (4%) 35 34	24, 45, 93, 117	0
2	C	0/6	-	-	-	-
2	D	0/6	-	-	-	-
All	All	511/562 (90%)	0.27	26 (5%) 28 27	24, 46, 93, 117	0

The worst 5 of 26 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	301	THR	4.0
1	A	263	PRO	3.6
1	B	304	PRO	3.5
1	B	334	ILE	3.4
1	A	297	LEU	3.3

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

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95<sup>th</sup> percentile and maximum values of B factors of atoms in the group. The column labelled ‘Q < 0.9’ lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å <sup>2</sup> )	Q<0.9
2	DAB	D	5	7/8	0.71	0.19	61,66,80,86	0
2	DAB	C	5	7/8	0.81	0.21	39,62,70,72	0
2	ALC	D	3	11/12	0.84	0.33	75,81,95,96	0
2	ALC	C	3	11/12	0.84	0.19	57,63,79,82	0
2	P4E	C	2	13/14	0.86	0.28	52,60,72,77	0
2	P4E	D	2	13/14	0.90	0.19	50,60,72,74	0
2	08M	C	4	16/17	0.91	0.15	36,52,71,74	0
2	08M	D	4	16/17	0.93	0.23	49,59,98,111	0

### 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.