



# Full wwPDB X-ray Structure Validation Report ⓘ

Sep 21, 2021 – 05:00 am BST

PDB ID : 6YXJ  
Title : Crystal structure of SARS-CoV macrodomain II in complex with human Paip1  
Authors : Lei, J.; Hilgenfeld, R.  
Deposited on : 2020-05-02  
Resolution : 3.50 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.

---

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

MolProbity : 4.02b-467  
Xtrriage (Phenix) : **NOT EXECUTED**  
EDS : **NOT EXECUTED**  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.23.1

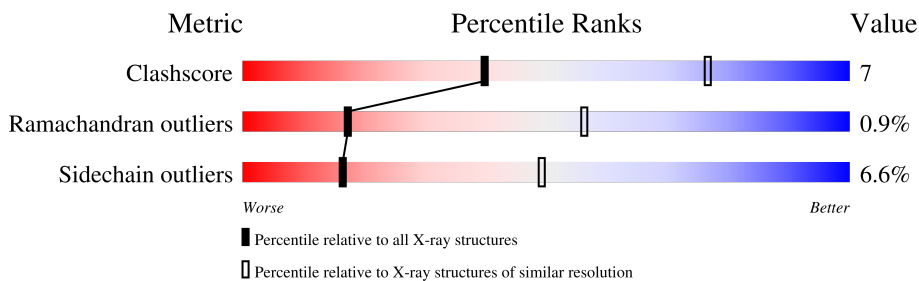
# 1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 3.50 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<br>(#Entries) | Similar resolution<br>(#Entries, resolution range(Å)) |
|-----------------------|-----------------------------|---|
| Clashscore            | 141614                      | 1036 (3.58-3.42)                                      |
| Ramachandran outliers | 138981                      | 1005 (3.58-3.42)                                      |
| Sidechain outliers    | 138945                      | 1006 (3.58-3.42)                                      |

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  $\leq 5\%$ .

Note EDS was not executed.

| Mol | Chain | Length | Quality of chain |
|-----|-------|--------|------------------|
| 1   | A     | 142    |                  |
| 2   | B     | 236    |                  |

## 2 Entry composition i

There are 2 unique types of molecules in this entry. The entry contains 2726 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 Non-structural protein 3.

| Mol | Chain | Residues | Atoms |     |     |     |   | ZeroOcc | AltConf | Trace |
|-----|-------|----------|-------|-----|-----|-----|---|---------|---------|-------|
|     |       |          | Total | C   | N   | O   | S |         |         |       |
| 1   | A     | 128      | 982   | 626 | 155 | 193 | 8 | 0       | 0       | 0     |

There are 4 discrepancies between the modelled and reference sequences:

| Chain | Residue | Modelled | Actual | Comment        | Reference  |
|-------|---------|----------|--------|----------------|------------|
| A     | 385     | GLY      | -      | expression tag | UNP P0C6U8 |
| A     | 386     | SER      | -      | expression tag | UNP P0C6U8 |
| A     | 387     | HIS      | -      | expression tag | UNP P0C6U8 |
| A     | 388     | MET      | -      | expression tag | UNP P0C6U8 |

- Molecule 2 is a protein called Polyadenylate-binding protein-interacting protein 1.

| Mol | Chain | Residues | Atoms |      |     |     |    | ZeroOcc | AltConf | Trace |
|-----|-------|----------|-------|------|-----|-----|----|---------|---------|-------|
|     |       |          | Total | C    | N   | O   | S  |         |         |       |
| 2   | B     | 218      | 1744  | 1099 | 297 | 338 | 10 | 0       | 0       | 0     |

There are 17 discrepancies between the modelled and reference sequences:

| Chain | Residue | Modelled | Actual | Comment        | Reference  |
|-------|---------|----------|--------|----------------|------------|
| B     | 61      | GLY      | -      | expression tag | UNP Q9H074 |
| B     | 62      | SER      | -      | expression tag | UNP Q9H074 |
| B     | 63      | HIS      | -      | expression tag | UNP Q9H074 |
| B     | 64      | MET      | -      | expression tag | UNP Q9H074 |
| B     | 65      | ALA      | -      | expression tag | UNP Q9H074 |
| B     | 66      | SER      | -      | expression tag | UNP Q9H074 |
| B     | 67      | MET      | -      | expression tag | UNP Q9H074 |
| B     | 68      | THR      | -      | expression tag | UNP Q9H074 |
| B     | 69      | GLY      | -      | expression tag | UNP Q9H074 |
| B     | 70      | GLY      | -      | expression tag | UNP Q9H074 |
| B     | 71      | GLN      | -      | expression tag | UNP Q9H074 |
| B     | 72      | GLN      | -      | expression tag | UNP Q9H074 |

*Continued on next page...*

*Continued from previous page...*

| Chain | Residue | Modelled | Actual | Comment        | Reference  |
|-------|---------|----------|--------|----------------|------------|
| B     | 73      | MET      | -      | expression tag | UNP Q9H074 |
| B     | 74      | GLY      | -      | expression tag | UNP Q9H074 |
| B     | 75      | ARG      | -      | expression tag | UNP Q9H074 |
| B     | 76      | GLY      | -      | expression tag | UNP Q9H074 |
| B     | 77      | SER      | -      | expression tag | UNP Q9H074 |

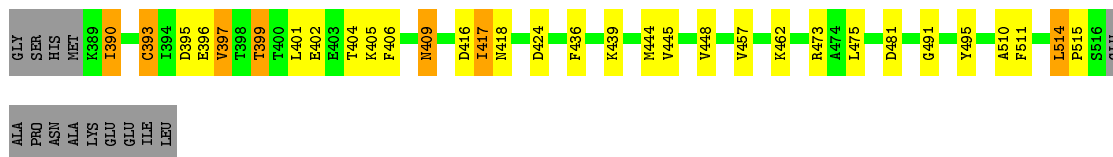
### 3 Residue-property plots

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. 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.

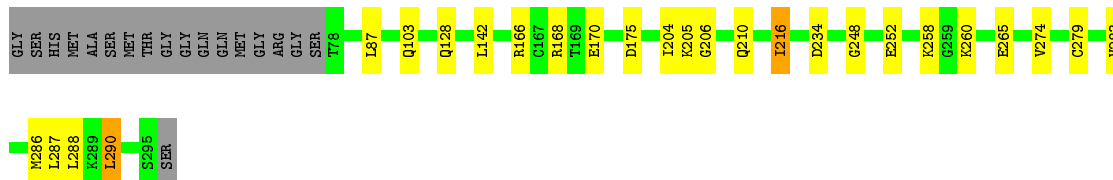
- Molecule 1: Non-structural protein 3

Chain A: 



- Molecule 2: Polyadenylate-binding protein-interacting protein 1

Chain B: 



## 4 Data and refinement statistics

Xtrriage (Phenix) and EDS were not executed - this section is therefore incomplete.

| Property   | Value  | Source    |
|--|--|-----------|
| Space group  | P 31 2 1                                       | Depositor |
| Cell constants<br>a, b, c, $\alpha$ , $\beta$ , $\gamma$ | 92.39Å 92.39Å 166.63Å<br>90.00° 90.00° 120.00° | Depositor |
| Resolution (Å)   | 30.94 – 3.50                                   | Depositor |
| % Data completeness<br>(in resolution range)             | 98.3 (30.94-3.50)                              | Depositor |
| $R_{merge}$  | 0.10   | Depositor |
| $R_{sym}$  | (Not available)                                | Depositor |
| Refinement program                                       | BUSTER 2.10.3 (20-MAY-2020)                    | Depositor |
| R, $R_{free}$  | 0.313 , 0.336                                  | Depositor |
| Estimated twinning fraction                              | No twinning to report.                         | Xtrriage  |
| Total number of atoms                                    | 2726   | wwPDB-VP  |
| Average B, all atoms (Å <sup>2</sup> )                   | 255.0  | wwPDB-VP  |

## 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     | 0.46         | 0/997   | 0.67        | 0/1345  |
| 2   | B     | 0.34         | 0/1768  | 0.51        | 0/2387  |
| All | All   | 0.39         | 0/2765  | 0.57        | 0/3732  |

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     | 982   | 0        | 1005     | 28      | 0            |
| 2   | B     | 1744  | 0        | 1746     | 15      | 0            |
| All | All   | 2726  | 0        | 2751     | 40      | 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 7.

All (40) 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:436:PHE:HA | 1:A:439:LYS:HZ3 | 1.31                     | 0.92              |
| 1:A:406:PHE:HA | 2:B:168:ARG:HD3 | 1.60                     | 0.84              |

*Continued on next page...*

*Continued from previous page...*

| Atom-1           | Atom-2           | Interatomic distance (Å) | Clash overlap (Å) |
|------------------|------------------|--------------------------|-------------------|
| 1:A:395:ASP:HA   | 1:A:511:PHE:O    | 1.86                     | 0.75              |
| 1:A:436:PHE:HB2  | 1:A:439:LYS:HZ1  | 1.57                     | 0.70              |
| 2:B:206:GLY:H    | 2:B:210:GLN:HA   | 1.55                     | 0.69              |
| 1:A:417:ILE:H    | 1:A:417:ILE:HD13 | 1.59                     | 0.67              |
| 1:A:417:ILE:H    | 1:A:417:ILE:CD1  | 2.09                     | 0.65              |
| 1:A:436:PHE:HA   | 1:A:439:LYS:NZ   | 2.10                     | 0.63              |
| 1:A:448:VAL:HG22 | 1:A:457:VAL:HG23 | 1.82                     | 0.61              |
| 2:B:274:VAL:HG11 | 2:B:288:LEU:HD21 | 1.84                     | 0.59              |
| 1:A:399:THR:HG21 | 2:B:216:ILE:HD12 | 1.86                     | 0.57              |
| 1:A:405:LYS:HD3  | 1:A:409:ASN:HA   | 1.86                     | 0.56              |
| 1:A:393:CYS:HA   | 1:A:510:ALA:HA   | 1.86                     | 0.56              |
| 1:A:514:LEU:HG   | 1:A:515:PRO:HD2  | 1.87                     | 0.56              |
| 1:A:436:PHE:CB   | 1:A:439:LYS:HZ1  | 2.19                     | 0.54              |
| 2:B:258:LYS:CB   | 2:B:260:LYS:HZ2  | 2.20                     | 0.54              |
| 2:B:258:LYS:HB3  | 2:B:260:LYS:NZ   | 2.23                     | 0.52              |
| 2:B:258:LYS:HB2  | 2:B:260:LYS:HZ2  | 1.75                     | 0.52              |
| 2:B:87:LEU:HD13  | 2:B:128:GLN:HG3  | 1.90                     | 0.52              |
| 2:B:287:LEU:HA   | 2:B:290:LEU:HD12 | 1.92                     | 0.51              |
| 1:A:416:ASP:HB2  | 1:A:417:ILE:HD13 | 1.91                     | 0.51              |
| 1:A:405:LYS:HZ2  | 1:A:409:ASN:HB3  | 1.74                     | 0.50              |
| 1:A:436:PHE:CA   | 1:A:439:LYS:HZ3  | 2.16                     | 0.50              |
| 1:A:417:ILE:HD13 | 1:A:417:ILE:N    | 2.26                     | 0.49              |
| 2:B:248:GLY:O    | 2:B:252:GLU:HB2  | 2.14                     | 0.48              |
| 1:A:390:ILE:HD12 | 1:A:481:ASP:HA   | 1.95                     | 0.48              |
| 2:B:258:LYS:CB   | 2:B:260:LYS:NZ   | 2.78                     | 0.47              |
| 1:A:402:GLU:H    | 1:A:402:GLU:CD   | 2.18                     | 0.46              |
| 1:A:436:PHE:CB   | 1:A:439:LYS:NZ   | 2.79                     | 0.46              |
| 2:B:234:ASP:OD1  | 2:B:279:CYS:HB2  | 2.16                     | 0.45              |
| 1:A:405:LYS:NZ   | 1:A:409:ASN:CB   | 2.80                     | 0.44              |
| 1:A:436:PHE:CA   | 1:A:439:LYS:NZ   | 2.79                     | 0.43              |
| 1:A:404:THR:HA   | 2:B:216:ILE:HG21 | 2.01                     | 0.42              |
| 1:A:395:ASP:O    | 1:A:396:GLU:HB2  | 2.20                     | 0.42              |
| 2:B:204:ILE:HD13 | 2:B:204:ILE:HA   | 1.95                     | 0.42              |
| 1:A:436:PHE:HB2  | 1:A:439:LYS:NZ   | 2.31                     | 0.42              |
| 1:A:444:MET:SD   | 1:A:445:VAL:O    | 2.78                     | 0.42              |
| 1:A:462:LYS:HD3  | 1:A:495:TYR:HA   | 2.02                     | 0.42              |
| 1:A:405:LYS:NZ   | 1:A:409:ASN:HB3  | 2.36                     | 0.41              |
| 2:B:283:VAL:O    | 2:B:286:MET:HB3  | 2.22                     | 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     | 126/142 (89%) | 116 (92%) | 7 (6%)  | 3 (2%)   | 6           | 35  |
| 2   | B     | 216/236 (92%) | 213 (99%) | 3 (1%)  | 0        | 100         | 100 |
| All | All   | 342/378 (90%) | 329 (96%) | 10 (3%) | 3 (1%)   | 17          | 56  |

All (3) Ramachandran outliers are listed below:

| Mol | Chain | Res | Type |
|-----|-------|-----|------|
| 1   | A     | 491 | GLY  |
| 1   | A     | 393 | CYS  |
| 1   | A     | 397 | VAL  |

### 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     | 110/121 (91%) | 99 (90%)  | 11 (10%) | 7           | 32 |
| 2   | B     | 195/207 (94%) | 186 (95%) | 9 (5%)   | 27          | 61 |
| All | All   | 305/328 (93%) | 285 (93%) | 20 (7%)  | 16          | 49 |

All (20) residues with a non-rotameric sidechain are listed below:

| Mol | Chain | Res | Type |
|-----|-------|-----|------|
| 1   | A     | 390 | ILE  |
| 1   | A     | 397 | VAL  |
| 1   | A     | 399 | THR  |

*Continued on next page...*

*Continued from previous page...*

| Mol | Chain | Res | Type |
|-----|-------|-----|------|
| 1   | A     | 401 | LEU  |
| 1   | A     | 409 | ASN  |
| 1   | A     | 417 | ILE  |
| 1   | A     | 418 | ASN  |
| 1   | A     | 424 | ASP  |
| 1   | A     | 473 | ARG  |
| 1   | A     | 475 | LEU  |
| 1   | A     | 514 | LEU  |
| 2   | B     | 103 | GLN  |
| 2   | B     | 142 | LEU  |
| 2   | B     | 166 | ARG  |
| 2   | B     | 170 | GLU  |
| 2   | B     | 175 | ASP  |
| 2   | B     | 205 | LYS  |
| 2   | B     | 216 | ILE  |
| 2   | B     | 265 | GLU  |
| 2   | B     | 290 | LEU  |

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](#)

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

There are no chain breaks in this entry.

## 6 Fit of model and data

### 6.1 Protein, DNA and RNA chains

EDS was not executed - this section is therefore empty.

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

EDS was not executed - this section is therefore empty.

### 6.3 Carbohydrates

EDS was not executed - this section is therefore empty.

### 6.4 Ligands

EDS was not executed - this section is therefore empty.

### 6.5 Other polymers

EDS was not executed - this section is therefore empty.