In the following, a general format for the input file of MITHRA is presented. The red icons or groups can be repeated in the text. *int* stands for an integer number, *real* represents a real value, and *string* denotes a string of characters. The reference directory in the path locations is the path where the simulation is started. In other words, “./” points to the location where the project is called.

```
MESH
{
  length-scale                = < real |
                                METER |
                                DECIMETER |
                                CENTIMETER |
                                MILLIMETER |
                                MICROMETER |
                                NANOMETER |
                                ANGSTROM >
  time-scale                  = < real |
                                SECOND |
                                MILLISECOND |
                                MICROSECOND |
                                NANOSECOND |
                                PICOSECOND |
                                FEMTOSECOND |
                                ATTOSECOND >
  mesh-lengths                = < ( real, real, real ) >
  mesh-resolution             = < ( real, real, real ) >
  mesh-center                 = < ( real, real, real ) >
  total-time                  = < real >
  total-distance              = < real >
  bunch-time-step             = < real >
  mesh-truncation-order       = < 1 | 2 >
  space-charge                = < true | false >
  solver                      = < NSFD | FD >
  optimize-bunch-position     = < true | false >
}

BUNCH
{
  bunch-initialization
  {
    type                      = < manual |
                                ellipsoid |
                                3D-crystal |
                                file >
    distribution              = < uniform | gaussian >
    file-name                 = < string >
    charge                    = < real >
    number-of-particles       = < int >
    gamma                     = < real >
    beta                      = < real >
    direction                 = < ( real, real, real ) >
    position                  = < ( real, real, real ) >
    sigma-position            = < ( real, real, real ) >
    sigma-momentum            = < ( real, real, real ) >
    numbers                   = < ( int, int, int ) >
    lattice-constants         = < ( real, real, real ) >
    transverse-truncation     = < real >
    longitudinal-truncation = < real >
    bunching-factor           = < real between 0 and 1 >
    bunching-factor-phase     = < real >
    shot-noise                = < true | false >
  }

  bunch-sampling
  {
    sample                    = < true | false >
    directory                 = < /path/to/location >
    base-name                 = < string >
    rhythm                    = < real >
  }

  bunch-visualization
  {
    sample                    = < true | false >
    directory                 = < /path/to/location >
    base-name                 = < string >
    rhythm                    = < real >
  }

  bunch-profile
  {
    sample                    = < true | false >
    directory                 = < /path/to/location >
    base-name                 = < string >
    time                      = < real >
    rhythm                    = < real >
  }
}

FIELD
{
  field-initialization
  {
    type                      = < plane-wave |
                                confined-plane-wave |
                                gaussian-beam >
    position                  = < ( real, real, real ) >
    direction                 = < ( real, real, real ) >
    polarization              = < ( real, real, real ) >
    radius-parallel           = < real >
    radius-perpendicular      = < real >
    signal-type               = < neumann | gaussian |
                                secant-hyperbolic |
                                flat-top >
    strength-parameter        = < real >
    offset                    = < real >
    pulse-length              = < real >
    wavelength                = < real >
    CEP                       = < real >
  }

  field-sampling
  {
    sample                    = < true | false >
    type                      = < over-line | at-point >
    field                     = < Ex | Ey | Ez |
                                Bx | By | Bz |
                                Ax | Ay | Az |
                                Jx | Jy | Jz |
                                F  | Q >
    directory                 = < /path/to/location >
    base-name                 = < string >
    rhythm                    = < real >
    position                  = < ( real, real, real ) >
    line-begin                = < ( real, real, real ) >
    line-end                  = < ( real, real, real ) >
    number-of-points          = < int >
  }

  field-visualization
  {
    sample                    = < true | false >
    type                      = < in-plane | all-domain >
    plane                     = < xy | yz | xz >
    position                  = < ( real, real, real ) >
    field                     = < Ex | Ey | Ez |
                                Bx | By | Bz |
                                Ax | Ay | Az |
                                Jx | Jy | Jz |
                                F  | Q >
    directory                 = < /path/to/location >
    base-name                 = < string >
    rhythm                    = < real >
  }

  field-profile
  {
    sample                    = < true | false >
    field                     = < Ex | Ey | Ez |
                                Bx | By | Bz |
                                Ax | Ay | Az |
                                Jx | Jy | Jz |
                                F  | Q >
    directory                 = < /path/to/location >
    base-name                 = < string >
    rhythm                    = < real >
    time                      = < real >
  }
}

UNDULATOR
{
  static-undulator
  {
    undulator-parameter       = < real >
    period                    = < real >
    length                    = < int >
    polarization-angle        = < real >
    offset                    = < real >
    distance-to-bunch-head    = < real >
  }

  static-undulator-array
  {
    undulator-parameter       = < real >
    period                    = < real >
    length                  = < int >
    polarization-angle      = < real >
    gap                     = < real >
    number                  = < int >
    tapering-parameter      = < real >
    distance-to-bunch-head  = < real >
  }

  optical-undulator
  {
    beam-type               = < plane-wave |
                                confined-plane-wave |
                                gaussian-beam >
    position                = < ( real, real, real ) >
    direction               = < ( real, real, real ) >
    polarization            = < ( real, real, real ) >
    radius-parallel         = < real >
    radius-perpendicular    = < real >
    signal-type             = < neumann | gaussian |
                                secant-hyperbolic |
                                flat-top >
    strength-parameter      = < real >
    offset                  = < real >
    pulse-length            = < real >
    wavelength              = < real >
    CEP                     = < real >
    distance-to-bunch-head  = < real >
  }
}
```

```
EXTERNAL-FIELD
{
  electromagnetic-wave
  {
    beam-type                = < plane-wave |
                                 confined-plane-wave |
                                 gaussian-beam >
    position                 = < ( real, real, real ) >
    direction                = < ( real, real, real ) >
    polarization             = < ( real, real, real ) >
    radius-parallel          = < real >
    radius-perpendicular     = < real >
    signal-type              = < neumann | gaussian |
                                 secant-hyperbolic |
                                 flat-top >
    strength-parameter       = < real >
    offset                   = < real >
    pulse-length             = < real >
    wavelength               = < real >
    CEP                      = < real >
  }
}

FEL-OUTPUT
{
  radiation-power
  {
    sample                   = < false | true >
    type                     = < at-point | over-line >
    directory                = < /path/to/location >
```

```
    base-name                    = < string >
    plane-position               = < real >
    line-begin                   = < real >
    line-end                     = < real >
    number-of-points             = < int >
    normalized-frequency         = < real >
    minimum-normalized-frequency    = < real >
    maximum-normalized-frequency    = < real >
    number-of-frequency-points      = < int >
  }

  power-visualization
  {
    sample                       = < false | true >
    directory                    = < /path/to/location >
    base-name                    = < string >
    plane-position               = < real >
    normalized-frequency         = < real >
    rhythm                       = < real >
  }

  bunch-profile-lab-frame
  {
    sample                       = < false | true >
    directory                    = < /path/to/location >
    base-name                    = < string >
    position                     = < real >
  }
}
```