Supplemental information

Large-scale two-photon calcium imaging
in freely moving mice

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Methods S1:

Additional performance tests and information required for building MINI2P systems. Related to STAR Methods
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1. Optics of MINI2P miniscope

(A) Optical simulation from HC-920 fiber output to sample plane. All optical components shown in A are commercially available. (B) Objective D0213 (water-immersed) was used for illustration. (C and D) Zemax simulation of objective D0277 with 170-μm coverslip and 2-mm prism (material: BK9).
2. Objective drawings and resolution test

(A) Optical and mechanical design of three objectives. Identical threads and similar distance between mounting reference (red dashed line) and imaging plane (blue dashed line) ensure that the three objectives are interchangeable. (B) Resolution test using MINI2P-L with three objectives. 3D imaging of 1-µm fluorescence beads was used to calculate 3D point-spread-function (PSF) of the microscope. Top: intensity of cross-section along x-axis centered at peak intensity position of beads image (example: dashed line on inserted image). Filled squares indicate recorded data; curve indicates Gaussian fit. Error bars indicate standard deviation of 6 beads data randomly selected from about 400×400 µm² in the center of FOV. XY FWHM indicates full width at half maximum of the Gaussian fitting. Inserted image: average image of 6 beads in the xy plane that the peak intensity located. Bottom: intensity of cross-section along z-axis centered at peak intensity position of the beads image (example: dashed line on the inserted image). Z FWHM indicates full width at half maximum of the Gaussian fitting. Inserted image: average image of 6 beads in the xz plane that the peak intensity located. xy pixel sizes: 780 nm, Stack interval: 1 µm.
3. Resolution and FOV measurement in different focal planes

(A to D) Axial resolution of the MINI2P microscope after scanning with quartet μTlens. (A and B) Imaging of 1-µm fluorescence beads taken by either moving the motorized stage which held the microscope (left in B, labelled as “stage”) or changing the focus of the quartet μTlens (right in B, titled as “Tlens”). (A) XY projection of beads image (with μTlens scanning). (B) XZ projection. (C and D) Cross-section along z-axis centered at the peak intensity position of each bead (dashed line on the right image) was used to calculate the axial full width at half maximum (FWHM) by stage scanning (C) or μTlens scanning (D). Dots indicate recorded data; curve indicates Gaussian fit. Error bars show standard deviation from 10 beads randomly selected over a FOV of 300×300 µm². z-axis FWMHs were extracted from the Gaussian fitting. Right image: average xz-projected image of 10 beads. (E) Usable FOVs of the MINI2P-L in different focus planes. Images of a 50-µm-grid test sample in 5 different focus planes (0 µm to 240 µm) with μTlens scanning. Field distortion has been corrected. Red dashed box indicates a 500×500 µm² area.
(A) By driving the EL-3-10 with full optical power (+30dpt, 200mA), the temperature increased more than 24 °C compared to the baseline temperature (0 dpt, 0 mA) when no driving current was given to the lens, reaching 48.0 °C within 10 minutes, when it stabilized to 49.3 °C (increase of...
25.8 °C) at 20 to 25 minutes. By driving the EL-3-10 with half optical power (about +15 dpt, 100 mA), a final temperature of 29.1°C was reached after 10 to 15 minutes, thus increasing only 5.6 °C. No temperature increase was noticed by driving the µTlens with full optical power (50V, +51 dpt) compared to the baseline temperature (0V, 0 dpt). The temperature was measured by attaching a 10 kΩ thermistor (TH10K, Thorlabs, NJ, USA) on the shell of the of the ETL (EL-3-10), or a smaller thermistor (TH100PT, Thorlabs) on the shell of the of the µTlens. The baseline temperature was calculated by averaging temperature measurements from 5 min to 1 min before the focus was changed (green line, from 0 mA to 200 mA or 100 mA). The final temperature was calculated by averaging temperature measurements from 20 min to 25 min after the focus was changed (green line, from 0 mA to 200 mA or 100 mA, or 0V to 50V). Temperature was measured every 0.5 s.

(B) System for measuring the relative focus of EL-3-10 and µTlens (quartet). The system is identical to that of Zong et al. (2021).

(C) Relative focus drift, defined as the normalized difference between the maximum and minimum photodetector signal after the focus is changed (green line), was 10.2% for EL-3-10 with full optical power (+30 dpt, 200 mA), 1.4% for EL-3-10 with half optical power (~+15 dpt, 100 mA), and 2% for µTlens (quartet) with full optical power (75 dpt, 50V). Grey box shows calculation of the relative drift of EL-3-10 with full optical power. The relative drift of EL-3-10 with half optical power, and that of the µTlens (quartet) with full optical power, were calculated in the same way. Note substantially larger focus drift of EL-3-10 compared to µTlens (quartet) with full optical power.
5. MEMS optimization

(A) Working frequency analysis for two types of MEMS scanners, one with a larger scanning angle but slower speed (MEMS-L), and the other with smaller scanning angle but faster speed (MEMS-F).

(B) Geometry and mathematics of MEMS scanning in MINI2P (see also STAR Methods for details).

(C) Scanning fields without distortion correction. Left: scanning field when fast axis and slow axis have the same scanning angle. Right: scanning field when scanning angle of the fast axis is √2 of the slow axis.
6. Three-step protocol for accurate FOV alignment

(A) Step1: primary FOV alignment based on overlapping landmarks. If wide-field imaging was not available, neighboring FOVs were first manually aligned by identifying overlapping landmarks on the averaged images. Left: green and purple arrows show two landmarks on both FOVs that were used for registration. Right: Overlap of the same two FOVs after stitching.

(B) Step2: refinement of the alignment by monitoring the image correlation: a small shift was made in the $x$ and $y$ directions (-5 pixels to 5 pixels) and the position of peak image correlation was identified and used to refine the alignment.

(C) Step3: Final check of alignment by assessing overlap between repeated cells (cells present in both FOVs): Suite2P extracted cells ROI are colored according to the FOV they belonged to and overlaid in the same image (green: FOV1, purple: FOV2, merged color: overlapping pixels). Repeated cells across neighboring FOVs should have large overlap values if the alignment is precise. If this was not the case, Step1 and Step2 would be reinitiated.

(D) Repeated cells were successfully removed by thresholding the data at an overlap ratio of 0.75.
7. Retinotopic mapping: hardware and data

(A) Pictures of the visual stimulation system for retinotopic mapping on visual cortices.

(B) Wide-field image of blood vessels on entire chronic window (4.6 mm).

(C) Average intensity of all images highlights visual cortices as the area with maximum response to the visual stimulation.

(D) Extracted horizontal retinotopic map.

(E) Extracted vertical retinotopic map.

(F) Sign map calculated from (D) and (E) for determining borders of visual cortices. Color indicates the sine value of the angle between vertical (V) and horizontal (H) retinotopic mapping gradients (red: 1; blue: -1). See Methods and Materials for details.
8. Design and construction of HC-920 fiber assembly

(A-C) Schematic of the HC-920 fiber assembly.

(A) The whole assembly consists of (B) a fiber coupler, a HC-920 fiber and (C) a fiber collimator.

(B) Components of the fiber coupler.

(C) Components of the fiber collimator.

(D) Illustration showing the fiber alignment stage (the black device on left) for making of fiber coupler and coupling laser into HC-920.

(E-G) Illustration showing making of the fiber collimator.

(E-F) Tools for aligning and collimating the fiber collimator.

(G) Adjusting distance between HC-920 fiber and collimating lens until the output beam is collimated.
9. System wiring and control

(A) Schematic of electrical hardware and wiring.

(B) Timing of control signals.

(C-E) Details of wiring of the controlling box, and the connection from the control box to the microscope.
10. Materials for assembly of a MINI2P miniscope

(A) All required components for assembling one MINI2P miniscope.

(B) All required equipment and tools for assembling one MINI2P miniscope (see Section 11 for details).
## Detailed imaging parameters for all imaging data

| Dataset ID | Data Acquisition Parameters |
|------------|----------------------------|
|             | **Exposure Time (min)**    |
|             | **Frame Rate (Hz)**        |
|             | **Volume Rate (Hz)**       |
|             | **FOV (μm)**               |
|             | **Number of Imaging Planes** |
|             | **Number of Repeated/Total Cells** |

### Additional Details

- **Recording age (weeks)**: [Data](#)
- **Weight gram**: [Data](#)

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**Legend for Imaging Parameters**

- **Red**: High intensity
- **Green**: Low intensity

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**Figures and Videos**

- **Fig.2B.iv**, **Fig.2D.i**, **Video S1 PIII**, **Fig.2D.iv**, **Fig.S2D**, **Fig.3F**, **Video S2**, **Fig.S4**, **Fig.S3A.iii**, **Fig.5A**, **Video S6 PI**, **Video S6 PII**
* Age is reported for the day of the first recording, weight is reported for the day of implantation;
** Laser power was measured under the objective; depth for VC and MEC is for the superficial imaging plane; for CA1 depth refers to the distance between 2 imaging planes (not applicable for CA1 single-plane imaging).
*** Only the most superficial plane was used for cell registration;
**** The 3 FOVs with the largest number of cells in each animal were included for statistics;
\$ With a 4-mm focal-length scan lens;
## 12. Shopping & Machining List

| Item ID | Source   | Accessibility | Description                      | Link   | Image | Quantity |
|---------|----------|---------------|-----------------------------------|--------|-------|----------|
|         | Thorlabs | purchase      | Spanner wrench 1                  | SPW30  |       | 1        |
| a.      | Thorlabs | Purchase      | Fiber stripping tool              | FTS4   |       | 1        |
| b.      | Thorlabs | purchase      | Fiber cleaver                     | XL411  |       | 1        |
| c.      | Thorlabs | purchase      | Spanner wrench 2                  | SPW602 |       | 1        |
| d.      | Thorlabs | purchase      | UV Curing LED system              | CD20K2 |       | 1        |
| e.      | Thorlabs | purchase      | Handheld laser source (635nm)     | HLS635 |       | 1        |
| f.      | Thorlabs | purchase      | Single mode patch cable           | P1-630Y-FC-2 | | 1    |
|         | Thorlabs | purchase      | Power and energy meter            | PM100D |       | 1        |
|   | Supplier | Action | Item Description                                      | Part Number | Quantity |
|---|----------|--------|------------------------------------------------------|-------------|----------|
|h. | Thorlabs | purchase | Photodiode power sensor S121C                       |             | 1        |
|i. | Thorlabs | purchase | Green LED (530nm) M530F2                             |             | 1        |
|j. | Thorlabs | purchase | NIR detector card VRC4                              |             | 1        |
|k. | RS       | purchase | Lens cleaning tissues MC-5                          |             | 1        |
|l. | Thorlabs | purchase | Foam cotton bud & swabs Swabs                       |             | 1        |
|m. | Thorlabs | purchase | Optical adhesive NOA61                              |             | 1        |
|n. | Thorlabs | purchase | Splice protector sleeve SPS60                       |             | 1        |
|o. | Winjee   | purchase | Distortion grid with 50um grid spacing R1L3S3P      |             | 1        |
|p. | 3M       | purchase | Silicone rubber back glue 704                       |             | 1        |
|q. | 3M       | purchase | Epoxy (black) DP420                                |             | 1        |
| q. | Ahlsell | purchase | Heat gun | [link](#) |
| r. | APE | purchase | Pulsed Check autocorrelator | [APE-NX](#) |
| s. | Thorlabs | purchase | Base to fixate Pulse Check on Optical Breadboard | [MB2025/M](#) |
| t. | Fabory | purchase | M2x5H Philips 7985225 | [M2screws](#) |
| u. | TRfastenings | purchase | M3x3mm Pan Head PoziDriv Machine Screw DIN7985 | [M3x3](#) |
| v. | Thorlabs | purchase | M4 capscrews kit | [HW-KIT1/M](#) |
| w. | Elfa Distrelec | purchase | Air duster Green PRF | [PRF 4-44](#) |
| x. | Surface Solutions | purchase | Black rubber spray | [SS black](#) |

**Core optics module**

**Mechanical components**

| 1 | Thorlabs | purchase | Nexus breadboard | [B3045L](#) |
| 2 | Thorlabs | purchase | Sorbothane feet | [AV6/M](#) |
|   | Manufacturer | Type               | Description                                      | Model   | Quantity |
|---|--------------|--------------------|--------------------------------------------------|---------|----------|
| 3 | Thorlabs     | purchase           | Fiber adapter plate                              | SM1SMA  | 1        |
| 4 | Thorlabs     | purchase           | Adjustable mirror mount                          | POLARIS-K05S2 | 2        |
| 5 | Thorlabs     | purchase           | Rotation mount & M3 screw                        | MRM05/M | 1        |
| 6 | Thorlabs     | purchase           | M6 cap screws kit                                | HW-KITZ/M | >20      |
| 7 | Wolida       | purchase           | Heat shrinkage tubings                           | Tube1   | 3        |
|   |              |                    | Wолида Ø0.6/0.4mm                                | Tube2   |          |
|   |              |                    | 2:1 ratio 2.5mm                                  | Tube3   |          |
| 8 | Thorlabs     | purchase           | 3 axis Microblock stage                          | MBT616D/M | 1        |
| 9 | Thorlabs     | Purchase            | XYZ Translation stage & right-angle bracket      | MT3A/M  | 1        |
|   |              |                     |                                                  | AB90E/M |          |
| 10| Thorlabs     | Purchase            | Compatible flexure stage mount                   | HCS020  | 1        |
| 11| Thorlabs     | Purchase            | Fiber clamp holds fiber                          | HFF001  | 3        |
| 12| Thorlabs     | purchase            | Fixed mounting bracket                           | AMA007/M | 1        |
| 13| Thorlabs     | purchase            | SM05 Threaded adapter to laser source            | AD1109F | 1        |
| No. | Manufacturer | Source | Description                                      | Part No. | Quantity |
|-----|--------------|--------|--------------------------------------------------|----------|----------|
| 14  | Thorlabs     | purchase | Kinematic cage cube                              | DFM1T3   | 1        |
| 15  | Thorlabs     | purchase | Kinematic cage cube base                         | DFM1B    | 1        |
| 16  | Thorlabs     | purchase | Lens tubes                                       | SM1L05   | 4        |
| 17  | Thorlabs     | purchase | End cap for machining                            | SM1CP2M  | 1        |
| 18  | Thorlabs     | purchase | Coupler                                          | SM1T2    | 3        |
| 19  | Thorlabs     | purchase | Optical beam shutter with controller for PMT     | SHB1     | 1        |
| 20  | Thorlabs     | purchase | Post mounting adapter                            | SHM1/M   | 1        |
| 21  | Kavli NTNU   | Self-made| Coupling box                                     | Github   | 1        |
| 22  | Kavli NTNU   | Self-made| Coupling box cup                                 | Github   | 1        |
| 23  | Kavli NTNU   | Self-made| Coupling holder                                  | Github   | 1        |
| 24  | Kavli NTNU   | Self-made| Coupling protector                               | Github   | 1        |
| No. | Manufacturer | Type       | Description                                                                 | Code         | Quantity |
|-----|--------------|------------|-----------------------------------------------------------------------------|--------------|----------|
| 25  | Kavli NTNU   | Self-made  | Collimator assemble tool                                                     | Github       | 1        |
| 26  | Kavli NTNU   | Self-made  | Collimator holder                                                           | Github       | 1        |
| 27  | Kavli NTNU   | Self-Made  | Control box shell                                                           | Github       | 1        |
| 28  | Kavli NTNU   | Self-Made  | Control box cup                                                             | Github       | 1        |

**Optical components**

| No. | Manufacturer                  | Type       | Description                                                                 | Code         | Quantity |
|-----|-------------------------------|------------|-----------------------------------------------------------------------------|--------------|----------|
| 29  | Toptica                       | purchase   | Laser source                                                               | FemtoFiber ultra 920 | 1        |
| 30  | Schott                        | purchase   | Tapered fiber bundle (TFB) XMLG, Ø 0.277"x98.4"[2.5 m] Drawing C54706.04   | 1838003      | 1        |
| 31  | NKT Photonics                 | purchase   | Hollow-core PCF, HC-920                                                    | K50-060-00   | 1        |
| 32  | Fuzhou Sunlight Technology    | purchase   | Glass rods (ZF62)                                                           | GLA-10x150-AR800-1100 | 3        |
| 33  | Fuzhou Sunlight Technology    | purchase   | Glass flange (7mm length Inside Ø 0.155 mm)                                 | TUB-1.8x7-0.155 | 2        |
| 34  | Thorlabs                      | purchase   | Prisms direct light from the seed laser up to the HC-920 fiber              | MRA12-P01    | 8        |
| 35  | Thorlabs                      | purchase   | Emission filter 525 nm green channel                                        | MF525-39     | 1        |
| 36  | Thorlabs                      | purchase   | Emission filter 630 nm red channel                                          | MF630-69     | 1        |
| 37  | Thorlabs                      | purchase   | Shortpass filter                                                            | FESH0750     | 2        |
| No. | Supplier     | Action     | Description                      | Part Number        | Quantity |
|-----|--------------|------------|----------------------------------|--------------------|----------|
| 38  | Thorlabs     | purchase   | Dichroic mirror                 | DMLP567R           | 1        |
| 39  | Thorlabs     | purchase   | Aspheric condenser lens         | ACL25416U-A        | 3        |
| 40  | Thorlabs     | purchase   | Coupling lens                   | C230TMD-B          | 1        |
| 41  | Thorlabs     | purchase   | Half-Wave plate                 | WPHSM05-915        | 1        |
| 42  | Thorlabs     | purchase   | Protected silver mirrors        | PF05-03-P01        | 2        |
| 43  | Edmunds      | Purchase   | Collimating lens                | #84-128            | 1        |

**Electrical components**

| No. | Supplier             | Action     | Description                          | Part Number        | Quantity |
|-----|----------------------|------------|--------------------------------------|--------------------|----------|
| 44  | Mirrorcle Technologies | purchase | MEMS driver (controller) BDQ PicoAmp 5.4 T180 | DR-11-055-00       | 1        |
| 45  | Digikey              | purchase   | BNC to SMA cables                    | CCBNS-MM-RG174-36  | 1        |
| 46  | RS                    | purchase   | DSUB15 connector plug (male)         | 472-859            | 2        |
| 47  | RS                    | purchase   | Backshell                            | 765-9448           | 2        |
| 48  | RS                    |            | DSUB15 Connector Socket (female)     | 472-865            | 2        |
| 49  | Digikey              | purchase   | 6-pin connector for MEMS            | FH19C-6S-0.5SH(10) | 1        |
| Item | Supplier | Type          | Description                                   | Quantity |
|------|----------|---------------|-----------------------------------------------|----------|
| 50   | Industrifil | purchase     | Single wire cables                           | 6        |
| 51   | Thorlabs | purchase     | μTLENS Driver                                | 1        |
| 52   | Thorlabs | purchase     | PMT                                           | 2        |
| 53   | Thorlabs | purchase     | Controller for shutter                      | 1        |

**Scope mounting module**

**Mechanical components**

| Item | Supplier | Type          | Description                                      | Quantity |
|------|----------|---------------|--------------------------------------------------|----------|
| 54   | Thorlabs | Purchase      | Aluminum optical breadboard                     | 1        |
| 55   | Thorlabs | Purchase      | Sorbothane feet                                 | 1        |
| 56   | Thorlabs | Purchase      | One-sided construction rail                     | 2        |
| 57   | Thorlabs | purchase      | One-sided construction rail                     | 2        |
| 58   | Thorlabs | Purchase      | Precision construction rail                     | 1        |
| 59   | Thorlabs | purchase      | Post Mounting Clamp                             | 1        |
| 60   | Thorlabs | purchase      | Manual Rotation Stage                           | 1        |
| #  | Supplier | Type         | Description                                                                 | Item Code  | Quantity |
|----|----------|--------------|-------------------------------------------------------------------------------|------------|----------|
| 61 | Thorlabs | Purchase     | Base for item 58                                                              | XT95P3     | 1        |
| 62 | Thorlabs | purchase     | Optical post                                                                  | TR75/M     | 2        |
| 63 | Thorlabs | modify       | Running wheel hardboard                                                        | Github, TB4 | 1/4      |
| 64 | Thorlabs | purchase     | M6 spacers & washers                                                           | W25S050    | >4       |
| 65 | Thorlabs | purchase     | Spacer on both sides of wheel                                                  | PS1M       | 2        |
| 66 | SKF      | purchase     | Bearing OD 19mm ID 6mm                                                          | 626-2Z     | 1        |
| 67 | Thorlabs | purchase     | Right-angle clamp                                                              | RSA90/M    | 1        |
| 68 | Thorlabs | purchase     | Pillar posts                                                                   | RS50/M     | 2        |
| 69 | Thorlabs | purchase     | Universal post holder                                                          | UPH100/M   | 3        |
| 70 | Thorlabs | purchase     | Locking Ball and Socket Mount; to support LEDs near Tracking Camera            | TRB1/M     | 8        |
| 71 | Thorlabs | purchase     | Adapter camera-lens                                                            | SM1A10Z    | 2        |
| 72 | Kavli NTNU | Self-made | MINI2P Holder P1                                                              | Github(Kavl i-ntnu, 2021) | 1        |
| 73 | Kavli NTNU | Self-made | MINI2P Holder P2                                                              | Github(Kavl i-ntnu, 2021) | 1        |
|   | Supplier   | Type            | Description                                                                 | Code   |
|---|------------|-----------------|-----------------------------------------------------------------------------|--------|
| 74| Kavli NTNU | Self-made       | MINI2P Holder P3                                                           | Github(Kavli-ntnu, 2021) |
| 75| Kavli NTNU | Self-made       | MINI2P Holder P4 & screw                                                    | Github(Kavli-ntnu, 2021) |
| 76| Kavli NTNU | Self-made       | Wheel Holder                                                                | Github  |
| 77| Kavli NTNU | Self-made       | Headbar holder & screw                                                      | Github  |
| 78| Thorlabs   | purchase        | LED & Accessories                                                           | LIU850A |
|    | RS         |                 | 850nm IR LED Array Light Source                                             | 780-0087|
|    |            |                 | LED 5m cable                                                                | 301-29-731|
|    |            |                 | Adapter                                                                     | 136-1345|
| 79| Thorlabs   | purchase        | Zelux 1.6 MP Monochrome CMOS Camera                                          | CS165MU/M |
|    |            |                 | & adapter SM1 to C-Mount                                                    | SM1A10Z |
| 80| Edmund Optics | purchase        | Lens focal length 4.5mm Or 8.5mm for lateral and frontal camera to control head fixation | 4.5mm |
|    |            |                 |                                                                            | 8.5mm |
| 81| Edmund Optics | purchase        | Basler camera for Animal Tracking                                           | acA2040-90um |
# Mobile cart and controlling system

## Mechanical and electrical components

| #  | Company                  | Category        | Item Description                                                                 | Item Code          | Quantity |
|----|--------------------------|-----------------|----------------------------------------------------------------------------------|--------------------|----------|
| 82 | Physik Instrumente (PI) | Purchase        | DC Motors                                                                        | M-112.2DG          | 3        |
| 83 | Thorlabs                 | Purchase        | Mobile cart                                                                      | POC001             | 1        |
| 84 | Thorlabs                 | Purchase        | Optical breadboard 600x900x55mm                                                  | PBG52506           | 1        |
| 85 | Thorlabs                 | Purchase        | Optional drawer                                                                  | POD001             | 1        |
| 86 | Schroff                  | Purchase        | 19-inch rack                                                                     | Ref 721-2708       | 1        |
| 87 | McMASTER-CARR            | Purchase        | Span-in nuts                                                                     | 90680A729          | 10       |
| 88 | Dell                     | Purchase        | Workstation is an Intel core i9 with operating windows 10 Pro                    | 7080               | 1        |
| 89 | Dell                     | Purchase        | (32”to 49”) curved LED-backlit LCD5K2K monitor                                   | Monitor            | 1        |
| 90 | Vidrio Technologies LLC | Purchase        | vDAQ card provides data acquisition and control of Laser, μTLens, shutter, among others | V-vDAQ.R1          | 1        |
| 91 | Vidrio Technologies LLC | Purchase        | vDAQ breadboard                                                                  | V-vDAQ.R1          | 1        |
| 92 | Physik Instrumente (PI) | Purchase        | Motion controller for PI motors                                                  | C-884.4DC          | 1        |
| 93 | Toptica                  | Purchase        | Controller for 920nm laser                                                        | FFUltra920         | 1        |
|   |   |   |   |   |   |
|---|---|---|---|---|---|
| 94 | Dustin | Purchase | USB-hub (7) ports | Deltaco | 1 |
| 95 | Thorlabs | Purchase | BNC Male to BNC Male & BNC adapters Female-Female | CA3136, T3283 | >10, >10 |
| 96 | Thorlabs | Purchase | BNC to SMA Male Connector | CA2848 | 2 |
| 97 | Thorlabs | Purchase | SMC connector | PAA101 | 2 |
| 98 | Thorlabs | Purchase | SMA-to- SMA cable | CA2912 | 2 |
| 99 | Thorlabs | Purchase | Power supply for μTLENS driver | TPS002 | 1 |

**Software**

|   |   |   |   |   |   |
|---|---|---|---|---|---|
| 100 | Vidrio Technologies LLC | Purchase | Open-source software for the whole system | ScanImage 2021 | 1 |
| 101 | Others | Free or purchase | See Protocol S4 | NA, NA | 1 |

**MINI2P miniscope**

**Mechanical components**

|   |   |   |   |   |   |
|---|---|---|---|---|---|
| 102 | Kavli NTNU | Self-made | Scope Body P1 | GitHub | 1 |
| 103 | Kavli NTNU | Self-made | Scope Body P2 | GitHub | 1 |
| Item | Supplier            | Type      | Description                                                   | Stockist | Quantity |
|------|---------------------|-----------|---------------------------------------------------------------|----------|----------|
| 104  | Kavli NTNU          | Self-made | Scope Body P3                                                 | GitHub   | 1        |
| 105  | Kavli NTNU          | Self-made | Stitching Adapters                                            | GitHub   | 25       |
| 106  | Kavli NTNU          | Self-made | Baseplate                                                     | GitHub   | 10       |
| 107  | Kavli NTNU          | Self-made | Alignment Tool                                                | GitHub   | 1        |
| 108  | FandWay TRfastenings| Purchase  | Screws for MINI2P: M1.2 x 3.0/4.0 pan head M1.6x 2.5 DIN916 – 45H (black) | M1.2cap M1.6set | >10 |

### Optical components

| Item | Supplier            | Type      | Description                                                   | Stockist | Quantity |
|------|---------------------|-----------|---------------------------------------------------------------|----------|----------|
| 109  | Domilight           | Purchase  | Scan Lens                                                     | D0166    | 1        |
| 110  | Fuzhou Sunlight Technology | Purchase  | Dichroic Mirror                                              | DMSP0405 | 1        |
| 111  | Domilight           | Purchase  | Objective1 Water+glass                                        | D0213-3X | 1        |
| 112  | Domilight           | Purchase  | Objective2 Air                                               | D0254-3X | 1        |
| 113  | Domilight           | Purchase  | Objective3 Water/air+glass                                    | D0277-3X*| 1        |
| 114  | Polight             | Purchase  | μTLENS & accessories 4 Stacked μTLENS Male-pin                | μTLENS-NIR-D-45 Mill-max1 | 1   |

### Electrical components

| Item | Supplier | Type      | Description                                                   | Stockist | Quantity |
|------|----------|-----------|---------------------------------------------------------------|----------|----------|
| 115  | Mirrorcle | Purchase  | FAST MEMS (MEMS-F)                                           | A7M10.2-1000AL | 1 |
*Order name for the new version: D0309*

Github repository: [https://github.com/kavli-ntnu/MINI2P_toolbox](https://github.com/kavli-ntnu/MINI2P_toolbox).

Note: In the attached files are the 3D drawings in STEP format that can be opened in multiple programs where three-dimensional data is represented. These 3D models are available for all the components of the MINI2P platform (both in-house and items bought). However, the 2D drawings given in DWG format are only for home-made components, whereas a link is provided to the 2D drawings of all the other bought components, which are accessible on the supplier's website.