

# Innovative Solutions for Addressing Space Constraints During Probe Implantation

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**Customer requests and feedback have resulted in many new probe designs and solutions.**

# Introduction

Traditional probes are designed with a straight shaft and connector distal from the tip and recording sites. For some labs, the orientation of the probe connector and the thickness of the headstage prevent probes from being placed close enough together to target the brain regions of interest. Customer requests and feedback have resulted in many new probe designs and solutions for addressing these space constraints.

# Custom Solutions

## Rotated Connector

The image above shows both the standard connector orientation and the rotated connector. Rotating the connector 90 degrees allows for the headstage to be plugged in from the top which can alleviate spacing issues. In addition to the rotated connector, grounding and referencing jumpers can be moved so that they are more easily accessible.

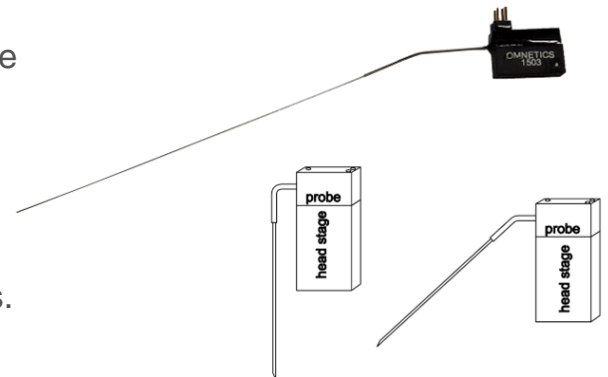


Standard Connector

Rotated Connector

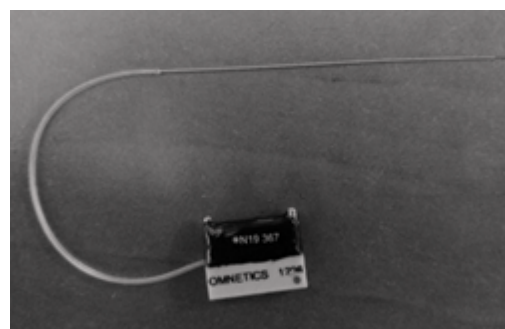
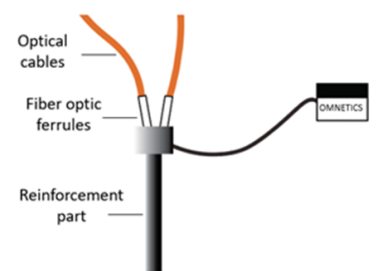
## Angled Reinforcement Tube

Probes can also be made with a “kink” in the reinforcement tube. Customers specify the angle and the location of this bend. Changing the angle of the reinforcement tube can make it easier to plug in the headstage when recording from brain regions that require the probes to be close together. The schematic shows examples of probes with bends of various angles.



## Pig-Tail

The unique pig-tail connector design allows for greater flexibility with site orientation and easier movement of the probe while in the microdrive. The length of the cable between the reinforcement tube and the connector can be customized. A block can also be added to hold the probe in a microdrive.



# Specific Use Case: Angled Reinforcement Tube with Rotated connector



## Background

This lab needed to insert two probes in close proximity.

## Solution

The lab addressed the space concern by adding a 90-degree kink and by rotating the connector 90 degrees. They also moved the location of the sockets.

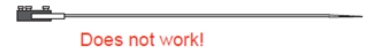
Standard socket arrangement



Side accessible socket arrangement



Note: sockets need to be accessible from front side (not from rear side)



## Final Probe Design For This Lab

K-Probe V-Probe with kink, 32-channel with 15 $\mu$ m electrode diameter; 50 $\mu$ m inter-electrode spacing; 110mm probe length (640 $\mu$ m; 20mm reinforcement tube); 260 $\mu$ m probe diameter; with one Omnetics CON/32m-V connector interface; 300 $\mu$ m tip to 1st site; \*\*kink at 10mm of reinforcement tube with 90 degree angle, connector rotated 90 degrees; side accessible sockets (see diagram)

## Discussion

This design addresses the inability to lower multiple probes at different angles and locations using a microdrive. Socket locations can be customized so that jumpers can be positioned on either side of the connector. Angle in the reinforcement tube can be between 0-90°.

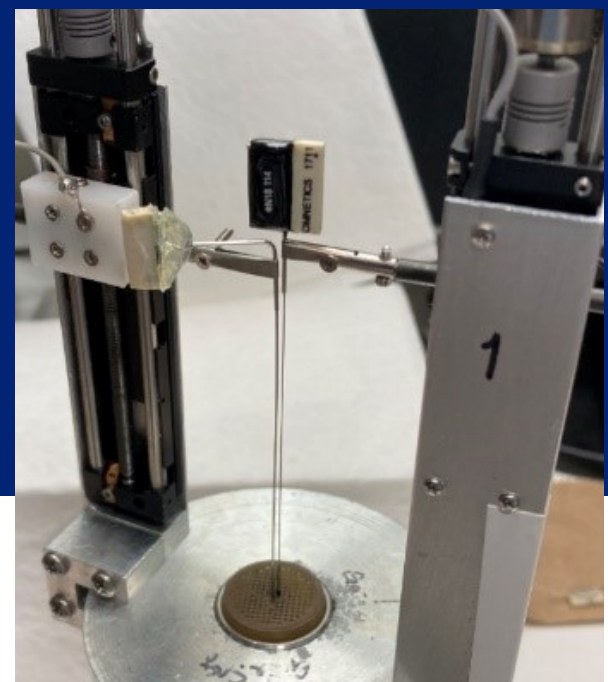


Image showing an example of how the kinked probe would be inserted and how the design makes inserting multiple probes easier.

# Specific Use Case: Pig-Tail

## Background

This lab was recording from deep structures and the standard configuration restricted the angle at which a probe could be inserted.

## Solution

The lab decided to use a 50mm pig-tail that would move the connector of the probe away from the shaft.

## Final Probe Design For This Lab

S-Probe, 16-channel, 8.5 $\mu$ m electrode diameter, Tungsten, Stereotrode configuration with 50 $\mu$ m intratrode spacing; 50 $\mu$ m intertrode spacing, 125mm total length (25mm; 640 $\mu$ m diameter reinforcement tube); 185 $\mu$ m probe diameter; (1) CON/16o25 connector interface off shank with 50mm pig-tail; stainless steel tip; 500 $\mu$ m tip to 1st electrode site

## Discussion

The pig-tail makes setup in microdrives much easier. It also gives the researcher another degree of freedom when determining the orientation of the contacts in the brain as the probe can be set up in any orientation (rotation) within the microdrive - which was not possible using the on-electrode connectors.

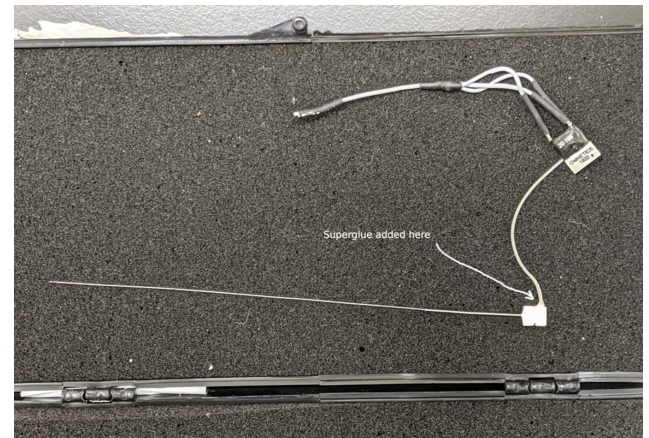


Image of the probe design with jumpers attached.

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