

Integrating Underwater OCEANS Analyzer into an EELS Robot

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Introduction. Capillary electrophoresis (CE) is a separation technique that can be applied to the analysis of complex organic and inorganic mixtures. It is an important subsystem in many instrument suites that quantify biosignature molecules. The submersible capillary electrophoresis analyzer (OCEANS) that was tested and demonstrated will be miniaturized and integrated into a segment of the EELS robotic architecture, which is in development to descend down into a vent at Enceladus and reach the subsurface ocean.



Fig.1. Photograph of an underwater capillary electrophoresis system performing water analysis.

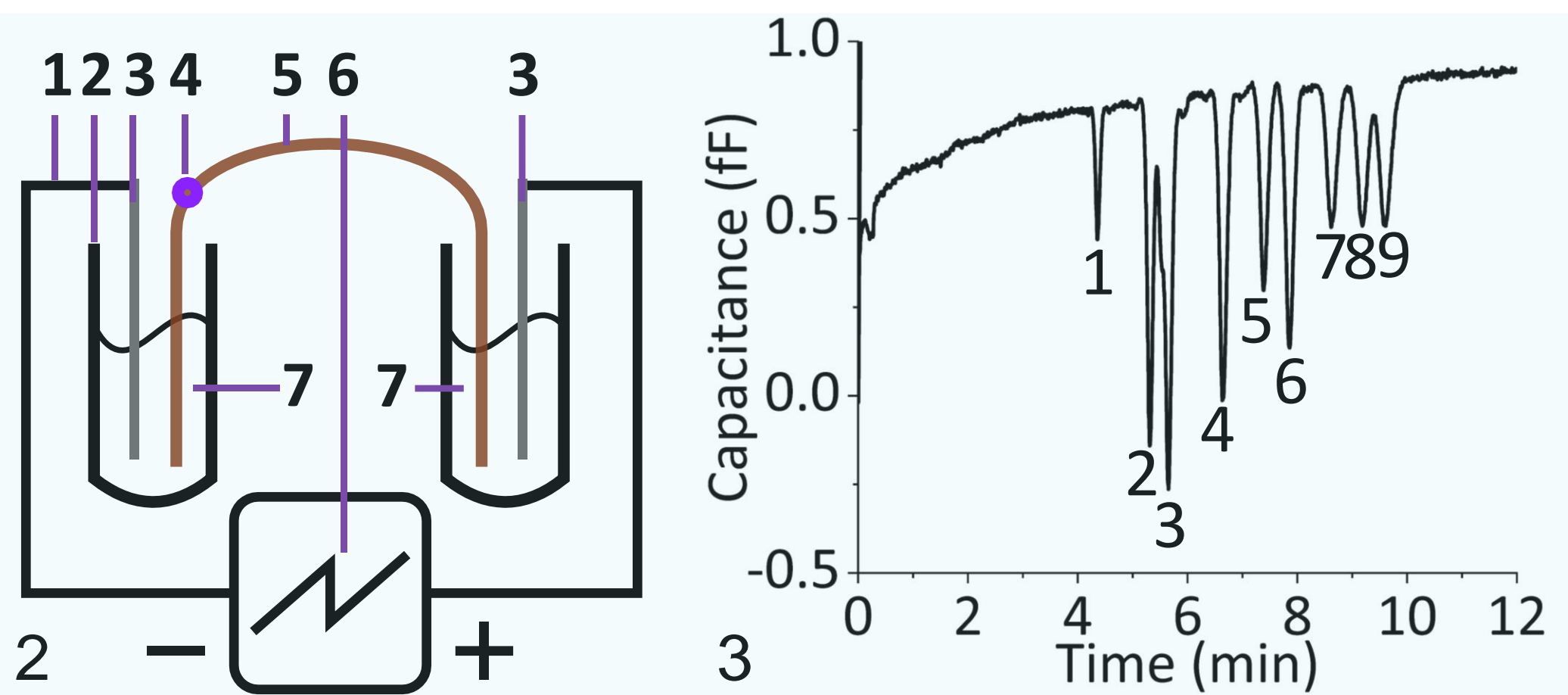


Fig.2. CE principle. Markings: 1-wire, 2-vial, 3-electrode, 4-detector, 5-separation capillary, 6-high voltage power supply, 7-background electrolyte

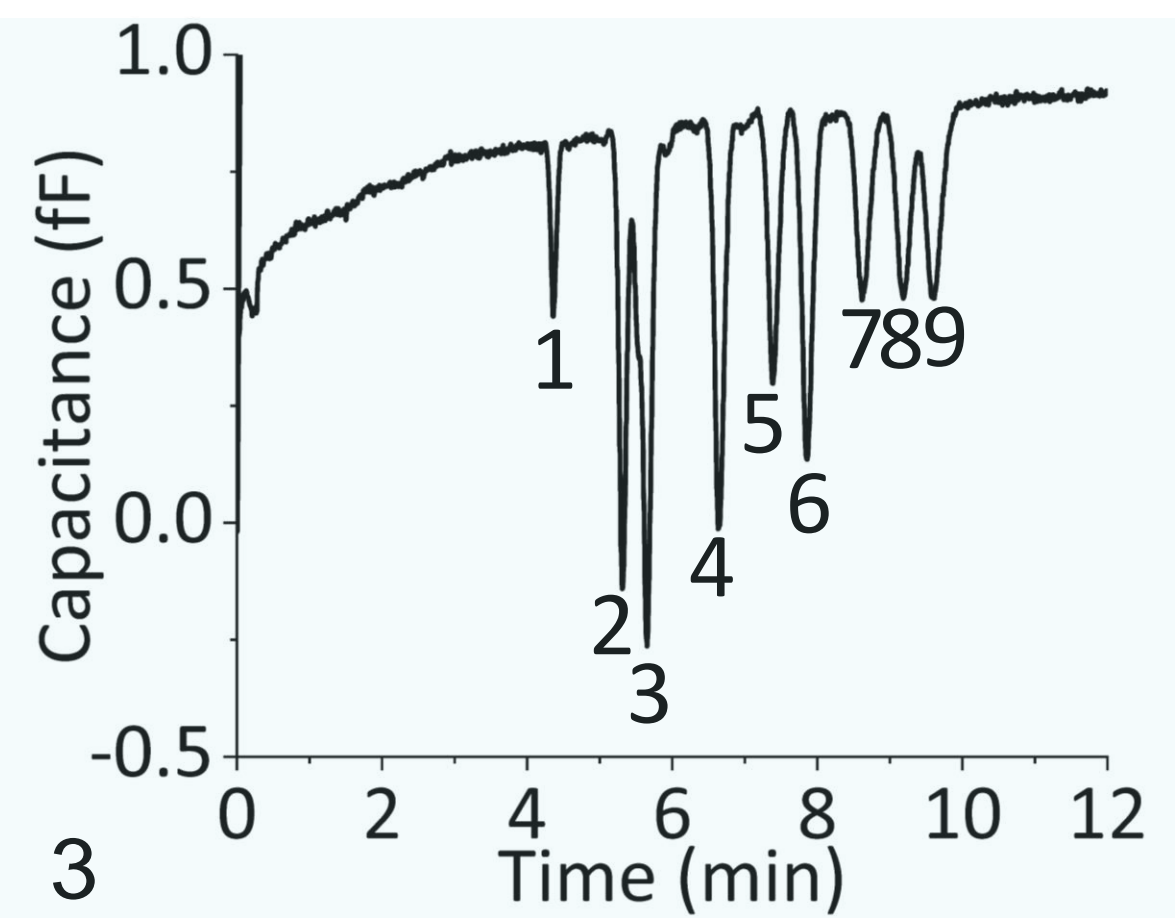


Fig.3. Electropherogram example *in lab*. Peaks: 1-K⁺, 2-Ca²⁺, 3-Mg²⁺, 4-Li⁺, 5-β-Ala, 6-His, 7-Gly, 8-Ala, 9-AIB

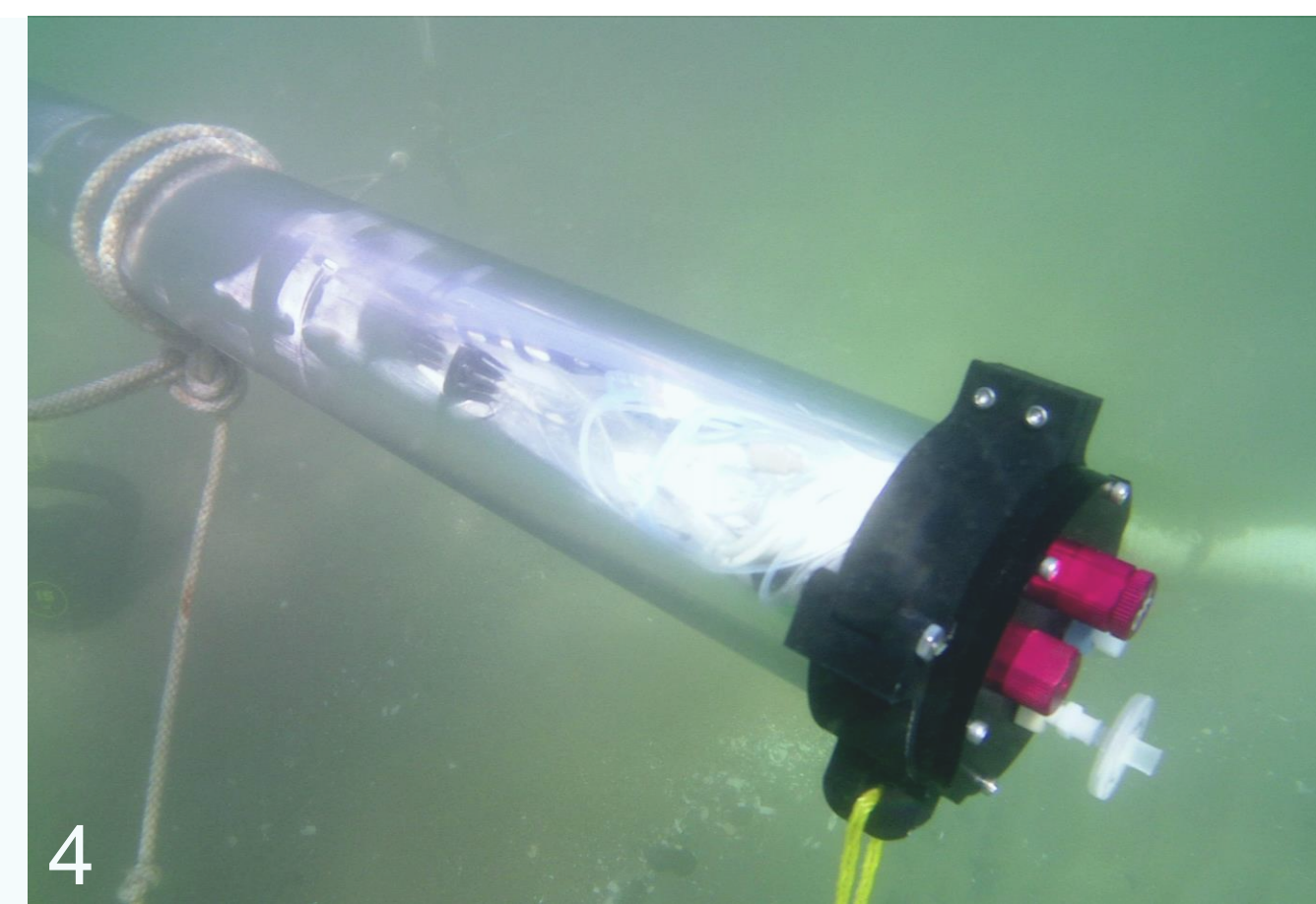


Fig.4. Photo of deployed underwater CE System *in situ*.

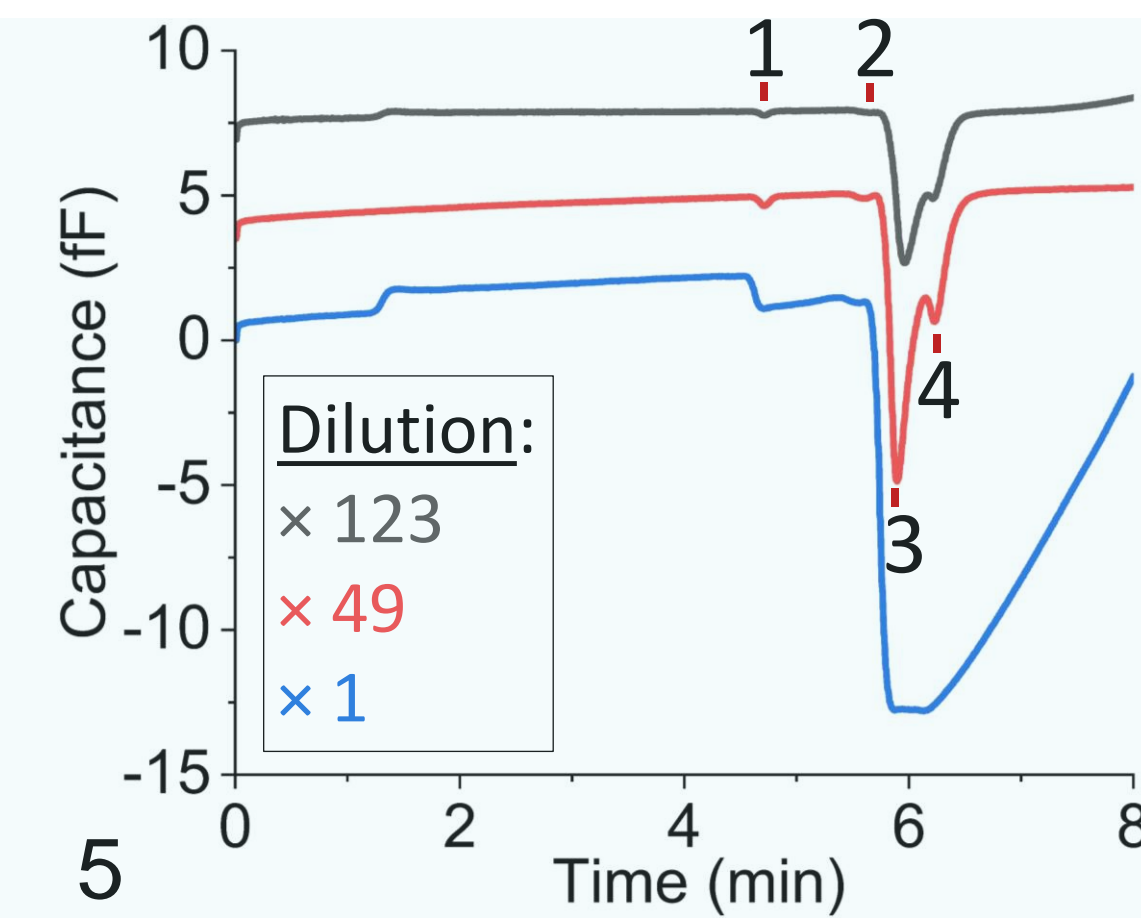


Fig.5. Electropherograms of *in situ* deployment. Peaks: 1-K⁺, 2-Ca²⁺, 3-Na⁺, 4-Mg²⁺

Table. Comparison between old, tested CE system and NEW CE system being designed

Parameter	OLD	NEW
Voltage (kV)	10	20
Length (cm)	150	30
Diameter (cm)	7.5	10
Inorganic cations	YES	YES
Inorganic anions	YES	YES
Amino acids	YES	YES
Amines	YES	YES
Limid of detection (μM)	5.2	<5.2
Operation time (h)	12	24+
Runs/ reagent load	12	15+
Sample dilution	2-step	2-step
Max dilution	x125	<125



Artists Concept

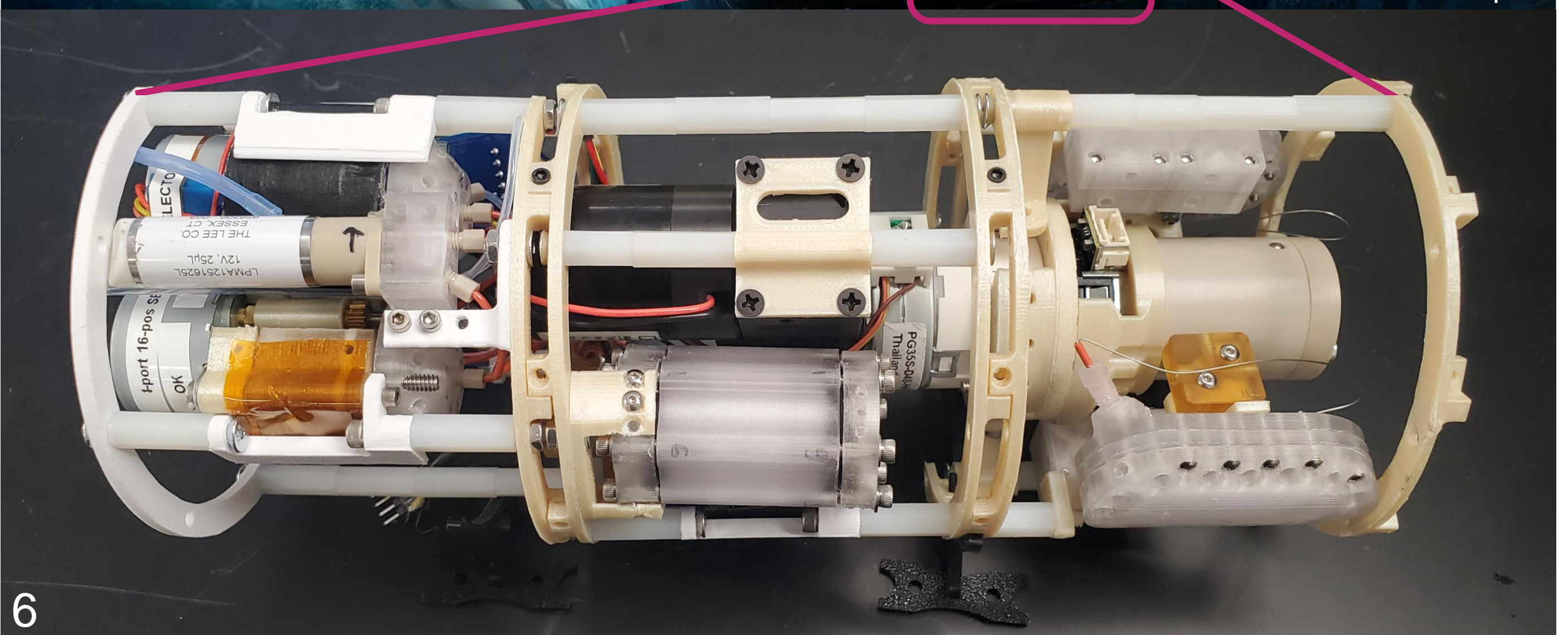


Fig.6. Schematic depiction of an integrated CE system into an EELS segment.

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