

Optical fibre sensing of endotracheal tube cuff contact pressure and trachea mucosa perfusion

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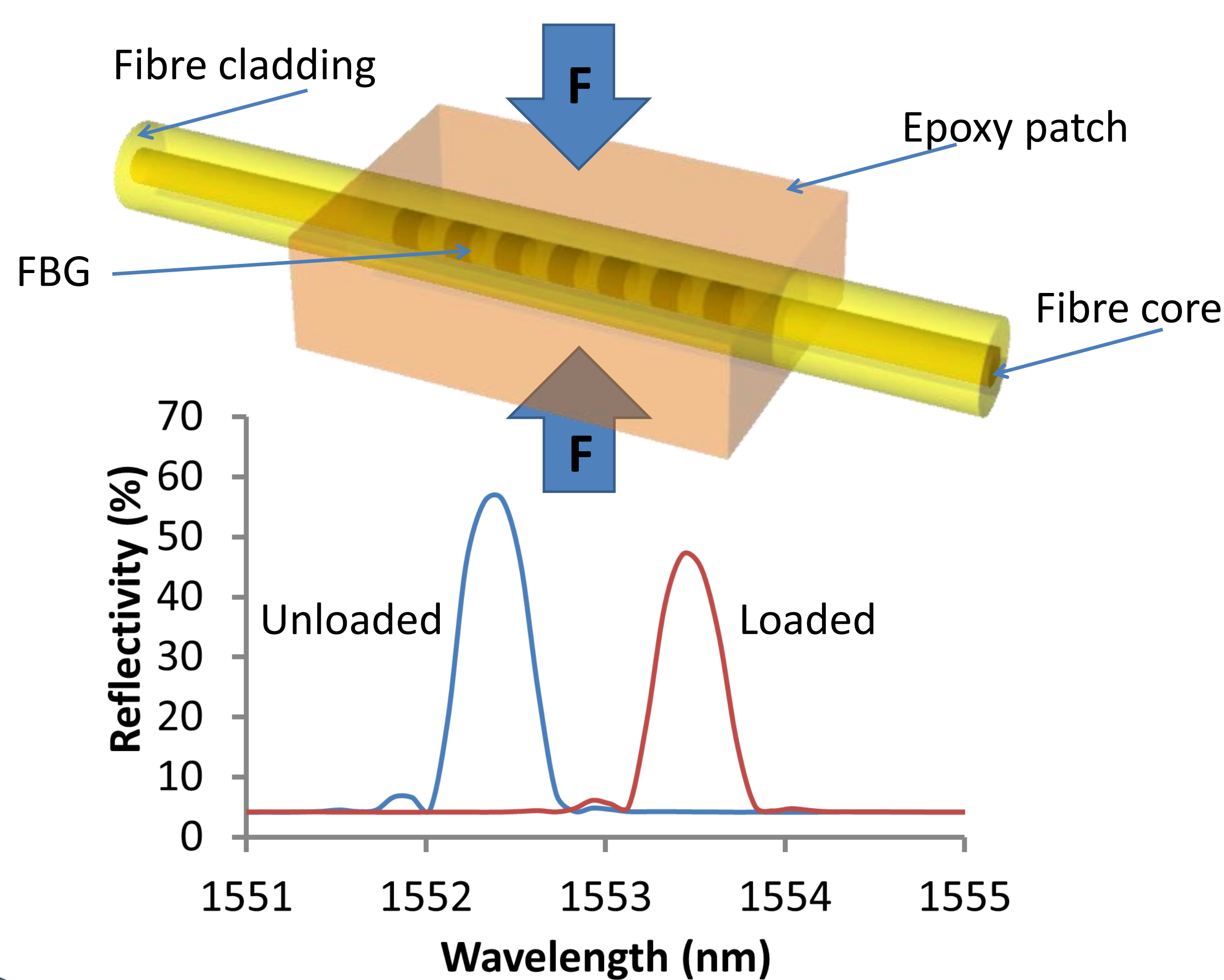
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1 - Introduction

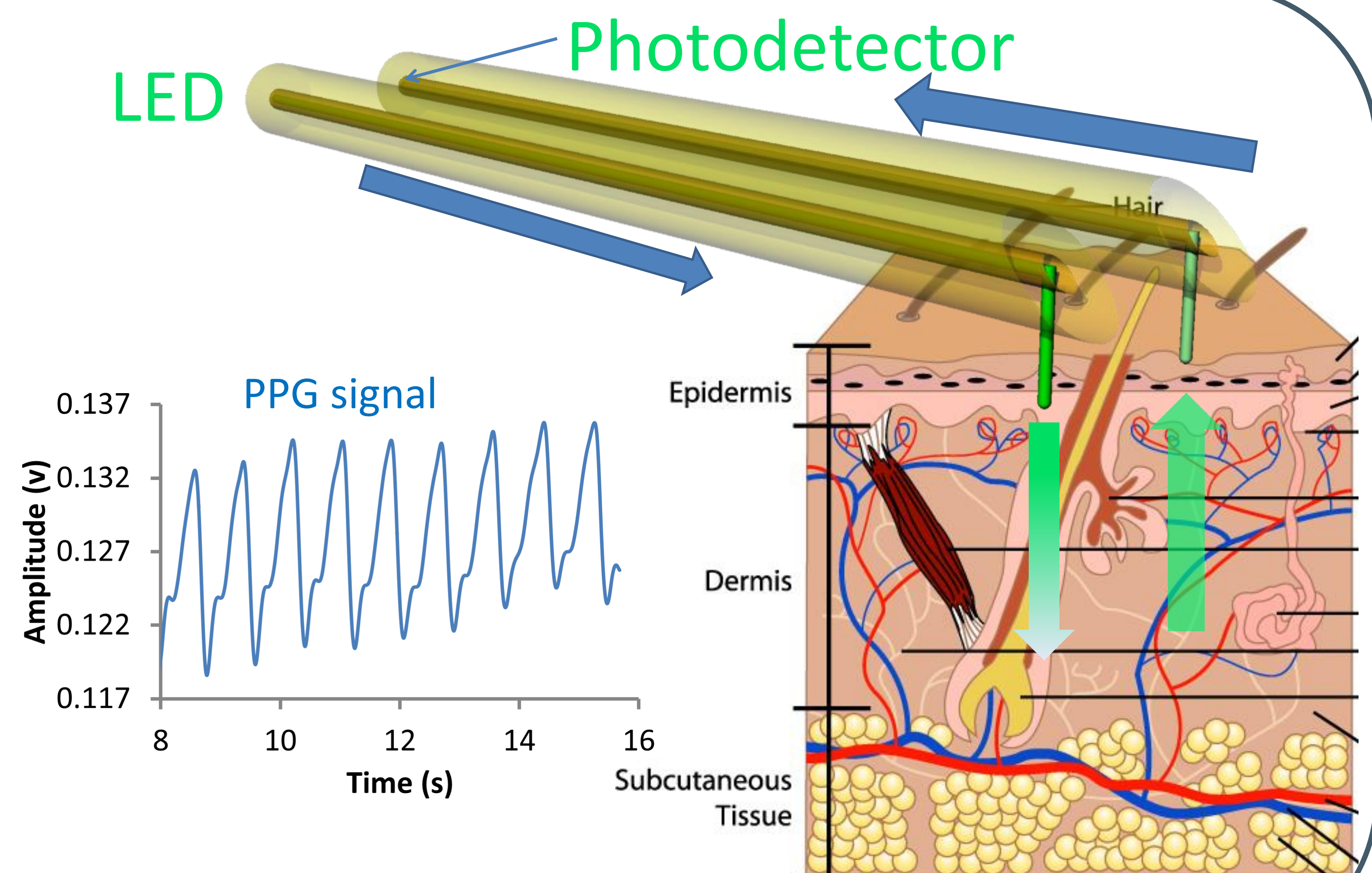
- ❑ **Endotracheal tube (ETT)**: disposable medical device used to deliver humidified gas into the lungs during mechanical ventilation.
- ETT's cuff sits in the trachea and has two functions: 1) to provide sealing and avoid leakage of the gas delivered around the tube; and 2) to act as a physical barrier to prevent aspiration of secretions from the airways to the lungs.
- Traditionally, clinicians measured the intra-cuff pressure as a surrogate of contact pressure. Intra-cuff pressures > 4.8 kPa impede capillary blood flow and the mucosal lining of the trachea may be damaged (long term stenosis). Intra-cuff pressures < 2.5 KPa may increase the risk of aspiration of mucosal secretions (causing a higher incidence of ventilator associated pneumonia) [1-3].

2 - Sensors working principle

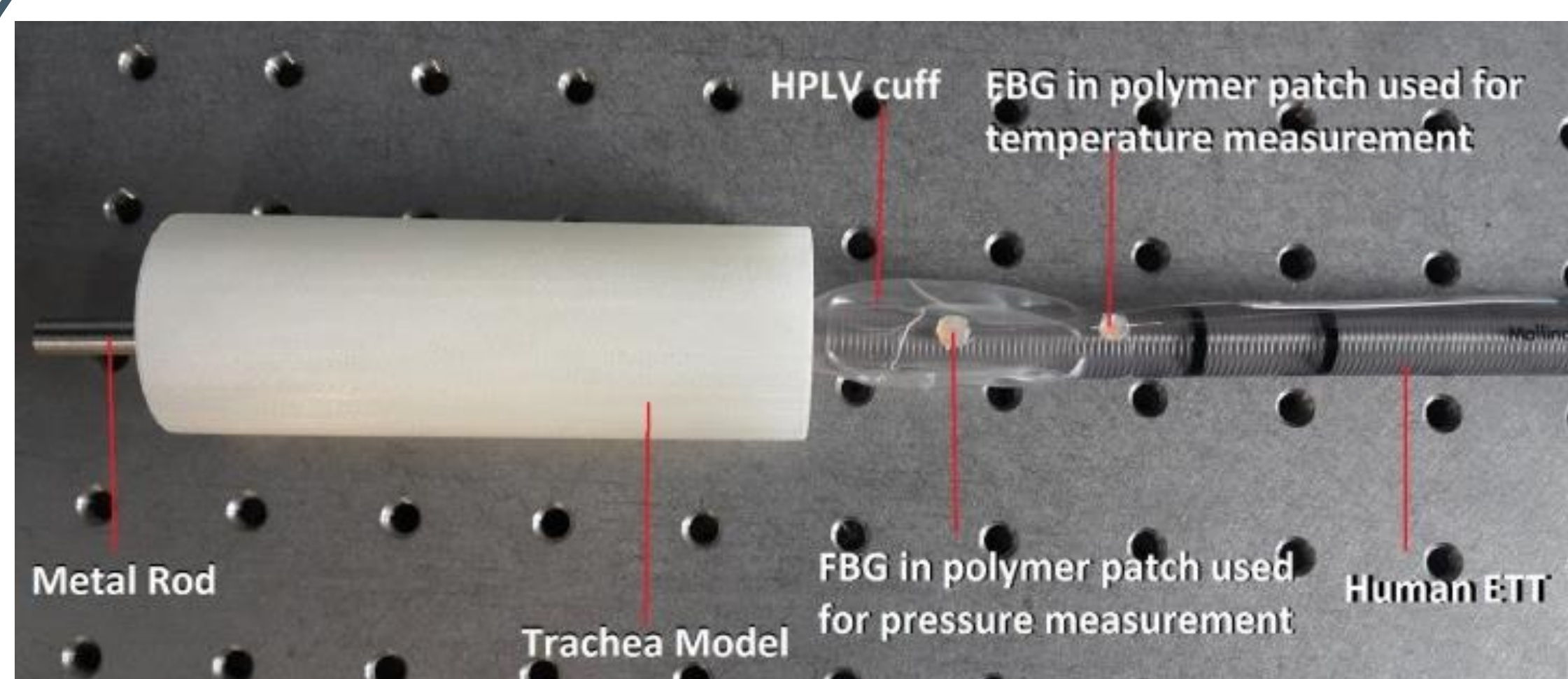
Contact Pressure



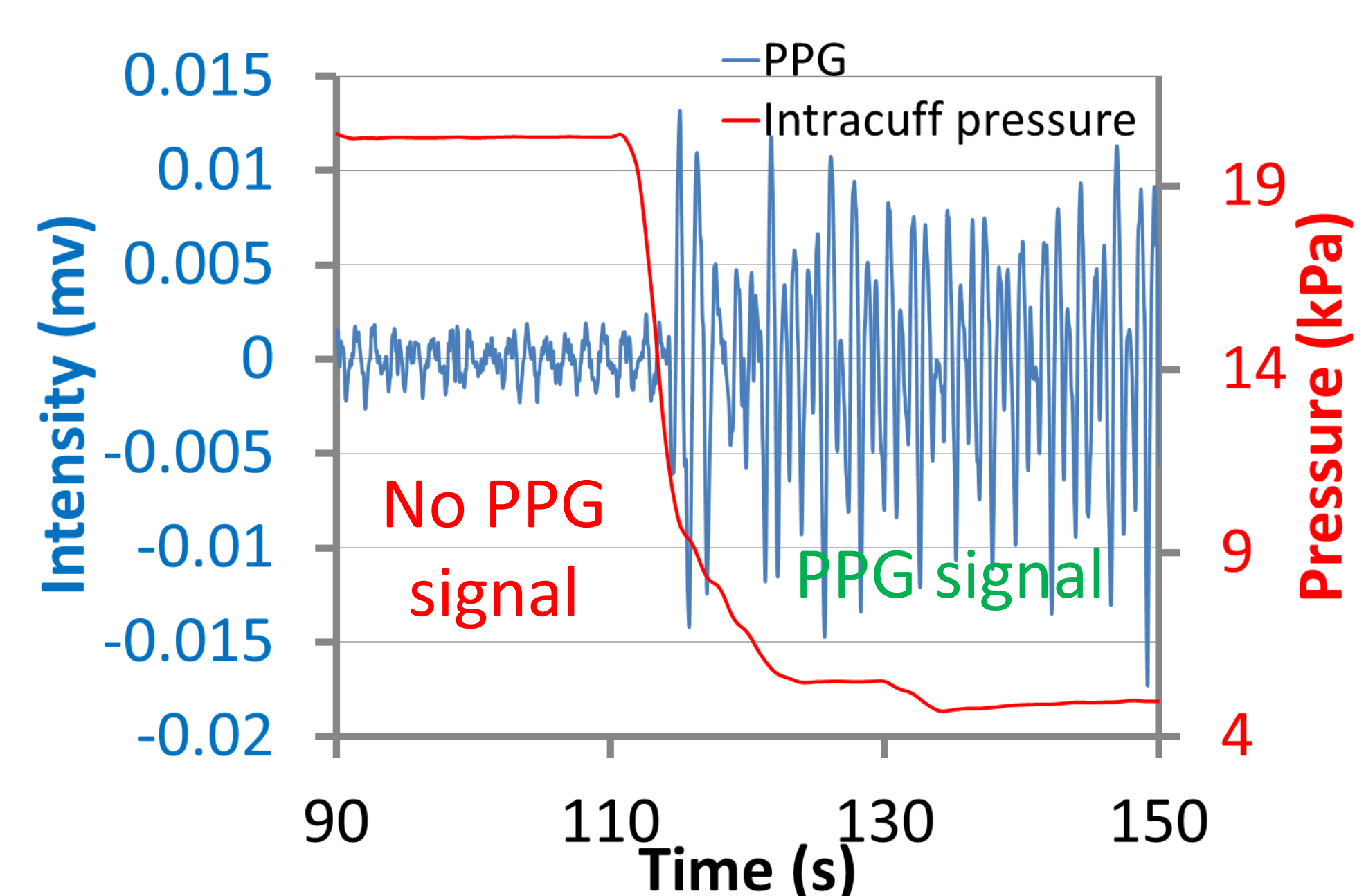
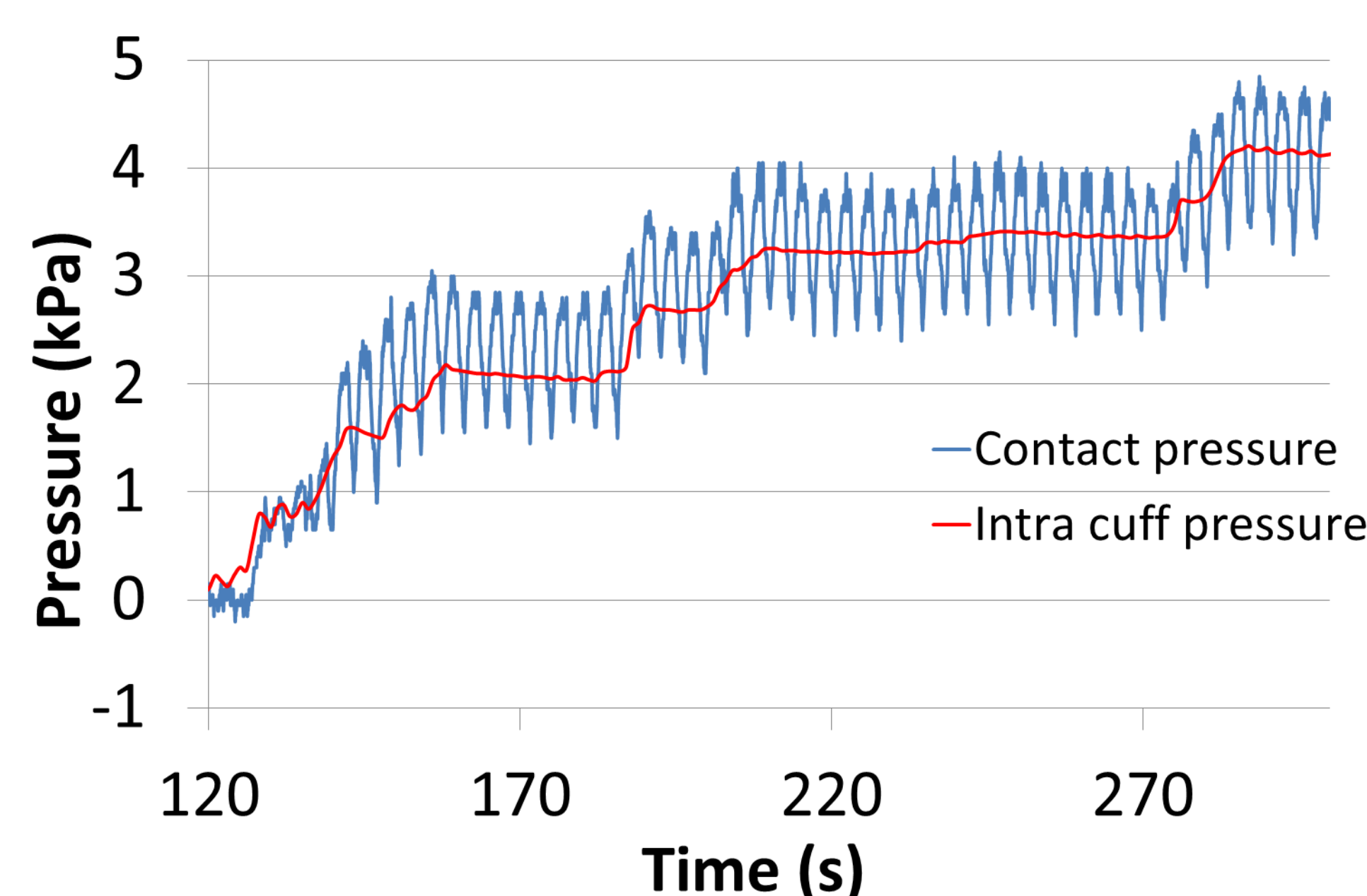
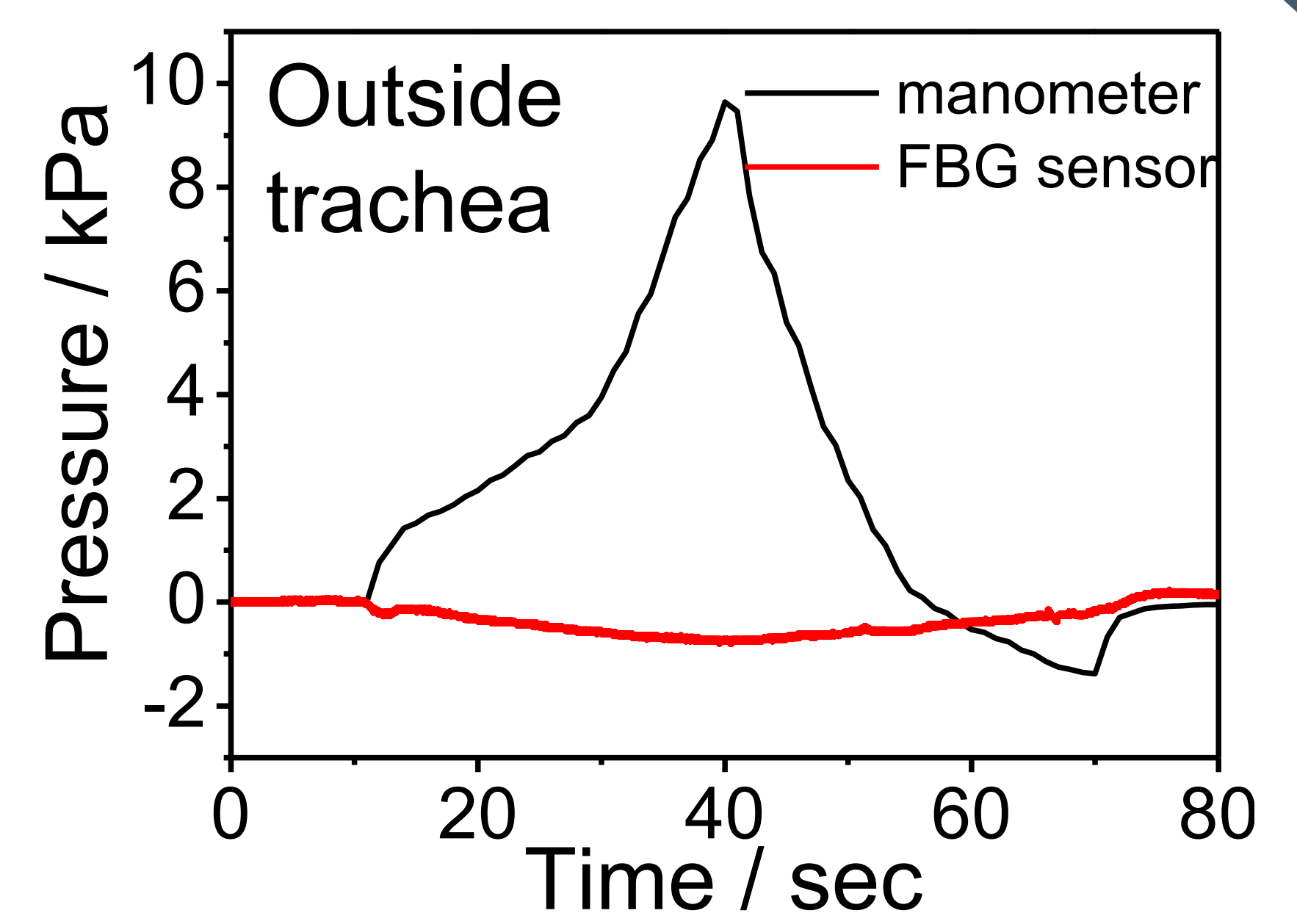
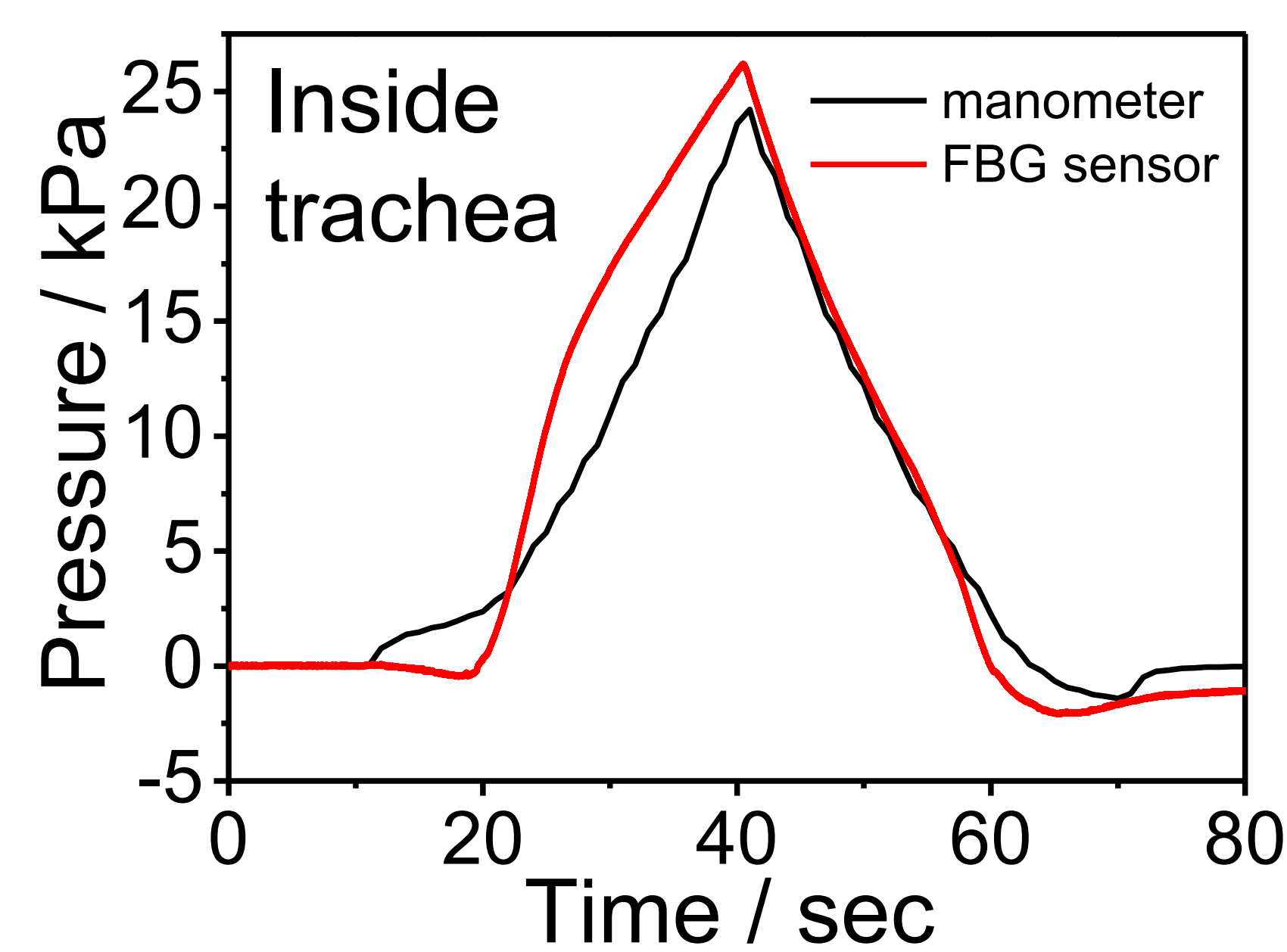
Perfusion



3 - Results



Trachea 3D printed model with instrumented ETT



REFERENCES

- [1] Seegobin, R. D. and Van Hasselt, G. L., "Endotracheal cuff pressure and tracheal mucosal blood flow: endoscopic study of effects of four large volume cuffs," BMJ 288, 965-968 (1984).
- [2] Stewart, S.L., Secrest, J.A., Norwood, B.R., and Zachary, R., "A comparison of endotracheal tube cuff pressures using estimation techniques and direct intracuff measurement," AANA 71(6), 443-447 (2003).
- [3] Lorente, L., Lecuona, M., Jiménez, A., Lorenzo, L., Roca, I., Cabrera, J., Llanos, C., and Mora, M.L., "Continuous endotracheal tube cuff pressure control system protects against ventilator-associated pneumonia," Critical Care 18(2), 1-8 (2014).

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