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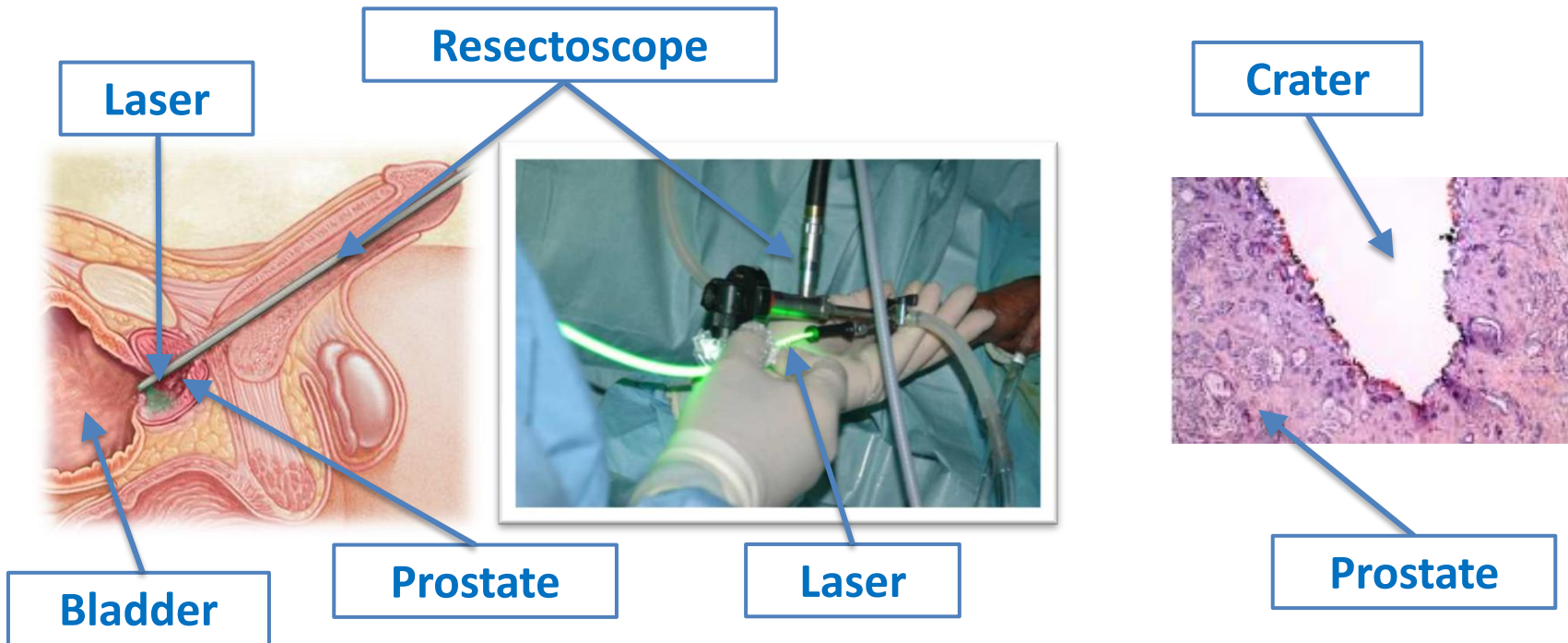
# “Flexible Robotic Approaches to Enhancing Laser Surgery and Microsurgery”

RoboSoft plenary meeting - Pisa, April 1, 2014



# Surgical scenario

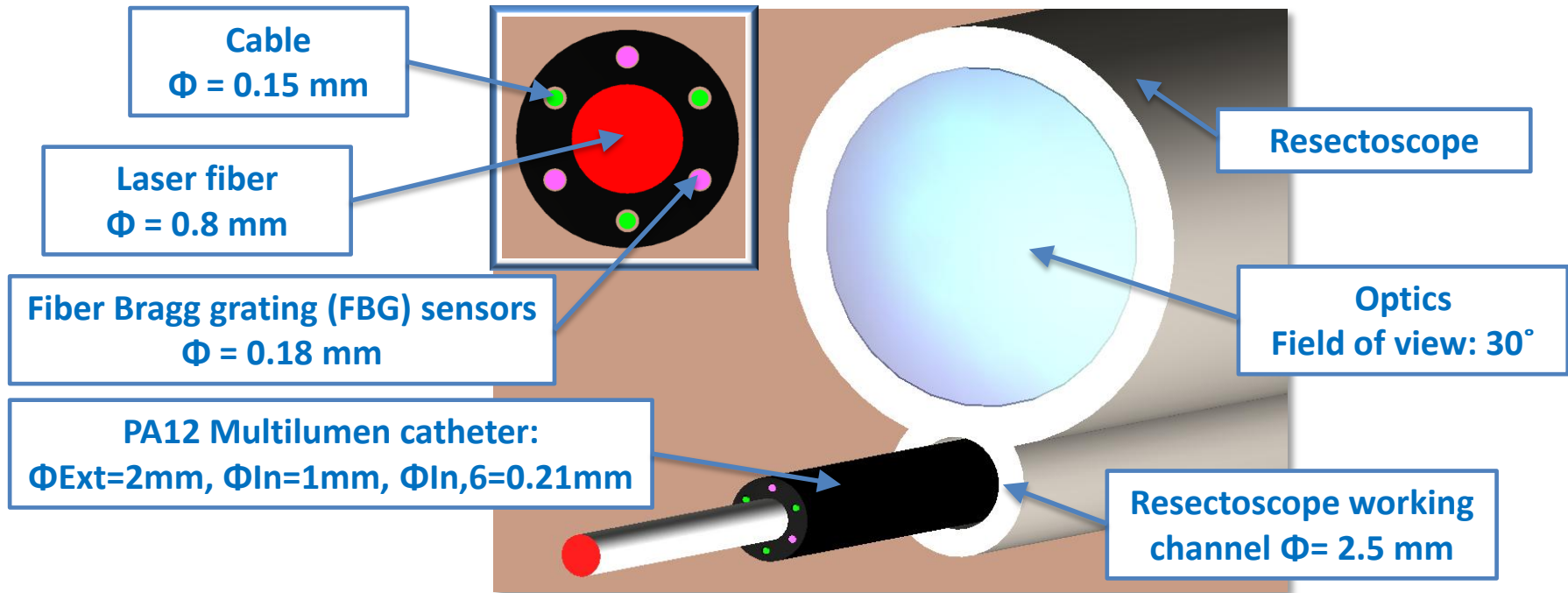
Transurethral laser ablation of the prostate for the treatment of benign prostatic hyperplasia (BPH)



## ISSUES:

- Limited dexterity and tactile feedback at the tip
- Not homogeneous ablation: carbonization and craters formation
- Decrease of accuracy, lengthening of operative and recovery time and increase of patient's pain

# ASTRO: Actuated and Sensorised Tool for laser assisted surgery of the prOstate

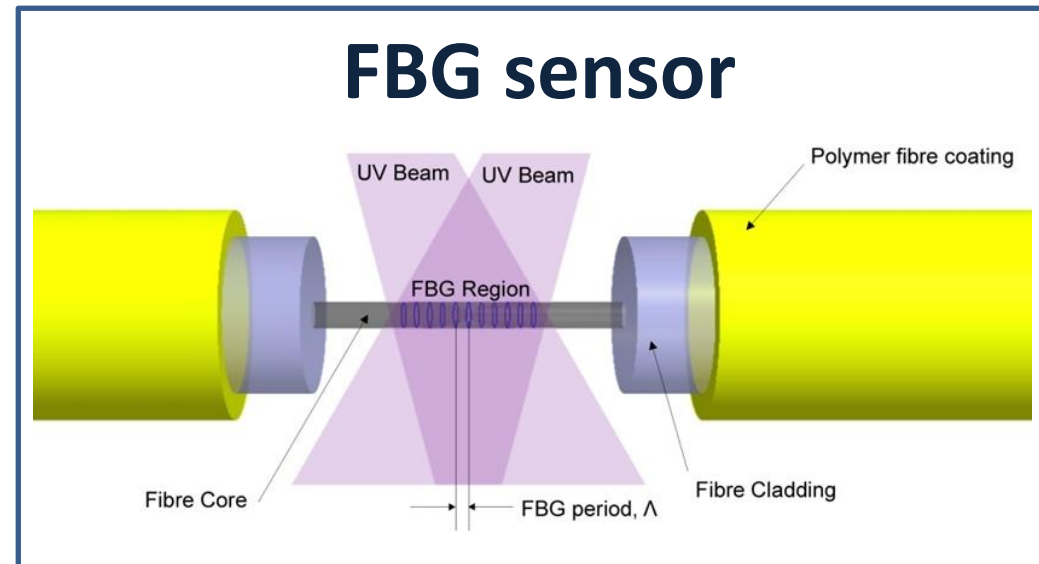


## Design of ASTRO:

- Flexible multilumen catheter in polyamide (PA12): optical isolation, mechanical continuum for strain transmission
- Integration of sensors for contact detection (FBG) between laser and prostatic tissue : miniature size, no cabling, biocompatibility, electromagnetic interference immunity
- Redundant sensors for temperature compensation
- Integration of cables for actuation

# ASTRO: Actuated and Sensorised Tool for laser assisted surgery of the prostate

- ✓ New assistive technologies and **flexible robotic tools** to provide safety, efficiency, and improved quality to **laser assisted surgical procedures**.
- ✓ Design and evaluation of a **novel, miniaturized, flexible robotic endoscopic system**, based on a **steerable catheter**, for laser assisted transurethral surgery of BPH.
- ✓ The central idea is to augment the **surgeon's dexterity, manipulation skills** and efficiency through advanced surgeon-robot interfaces, **sensors** and **actuators**.



- ✓ Preliminary study demonstrated the ability of the system to sense contact forces between the laser fiber and the target tissue of up to **1 mN** and to steer the laser tip inside the prostatic urethra of about  **$\pm 10^\circ$** .