Status of Calibration and Measurement Activities of KRISS in Fiber Optics

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Contents

• KRISS Fiber Optics Team
• History
• Service Items
• Service Status
• Standard Setup
• Current Research
• Collaboration Issues
KRISS Fiber Optics Team

Dr. Seung Kwan Kim
- Project leader
- Fiber optic power
- Polarization

Dr. Kee-Suk Hong
- Optical fiber length
- Optical fiber attenuation
- Single photon source

Dr. Sun Do Lim
- Return loss
- Dispersion
- Mid-IR fiber source

Mr. Ki-Lyong Jeong
- Calibration and Testing
- Customer liaison
### History

- **2003**  
  Fiber optic power responsivity scale at 1310 nm and 1550 nm

- **2005**  
  Optical fiber length, attenuation scale and reference standard

- **2006**  
  PMD, PDL scale and reference standard

- **2006**  
  Informal bilateral comparison on PMD with NIST

- **2006~2014**  
  Piloting APMP TCPR SC on fiber optic power responsivity (1310 nm, 1550 nm)

- **2011**  
  Informal bilateral comparison on fiber power with NIST

- **2012~2014**  
  Participating in EMRP MIQC project

- **2014**  
  Fiber optic power responsivity scale at 1625 nm

- **2014~**  
  Tunable fiber laser at 2 µm range, OPO in 2.5 µm ~ 3.5 µm, OPO in 5 µm ~ 8 µm

- **2015~**  
  Piloting APMP TCPR SC on optical fiber length (1310 nm, 1550 nm)

- **2016~**  
  Participating in COOMET SC on polarization mode dispersion
Service Items

• Calibration
  – Fiber optic power meter / Optical power meter
  – Optical fiber length reference
  – Optical fiber attenuation reference
  – Optical spectrum analyzer
  – Return loss reference
  – Polarization mode dispersion analyzer
  – Polarization dependent loss reference
  – Variable optical attenuator

• Test
  – Fiber optic source (LASER, LED)
## Service Status

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Standard Setup (1/3)

Fiber optic power responsivity

Recently we added 1625 nm.
Standard Setup (2/3)

**Optical fiber length (Time of Flight)**

![Diagram of Optical fiber length setup]

- LS, laser source
- PC, polarization controller
- PD, photo-detector
- PG, pulse generator
- VOA, variable optical attenuator
- M, modulator
- DC, directional coupler
- OC, optical connector
- FUC, fiber under test
- OSC, oscilloscope

**Optical fiber attenuation (Cut-back)**

![Diagram of Optical fiber attenuation setup]

- LS, laser source
- VOA, variable optical attenuator
- PC, polarization controller
- PD, photo-detector
- BFA, bare fiber adaptor
- FUC, fiber under test

**Return loss (Opt. Cont. Wave Refl.)**

![Diagram of Return loss setup]

- FP-LD, Fabry-Perot laser diode
- VOA, variable optical attenuator
- PC, polarization controller
- OPM, optical power meter

DC, directional coupler; FC, frequency counter; LS, laser source; M, modulator; OC, optical connector; OSC, oscilloscope; PD, photo-detector; PG, pulse generator; VOA, variable optical attenuator.
Standard Setup (3/3)

**Polarization Mode Dispersion**
- JME method

**Polarization Dependent Loss**
- pol. scanning method
Current Research (1/4)

2 µm band tunable fiber laser (single longitudinal mode)

2 μm band tunable fiber laser: wavelength tunability ≥ 120 nm
- **MIR-OPO (1)**
  - MgO:PPLN
  - Pump: 1064 nm DPSS Laser
  - Signal: 1.5 μm ~ 1.9 μm
  - Idler: 2.5 μm ~ 3.5 μm
Current Research (4/4)

- **MIR-OPO (2)**
  - ZGP
  - Pump: 2 µm Fiber Laser
  - Signal: 2.8 µm ~ 3.2 µm
  - Idler: 5.3 µm ~ 7.0 µm
Collaboration Issues

• High power optical power meter

• Multimode fiber power meter

• References for Multimode OTDR

• Fiber optics in Mid-IR band
Thank you very much for your kind attention!