

# OpenFMR: A low-cost open-source broadband ferromagnetic resonance spectrometer

## Supplemental Material

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### List of alternatives

#### Signal generator:

- DS Instruments SG30000PRO (up to 30GHz)
- DS Instruments SG40000L (25 to 40 GHz)
- AnaPico APSYN140 + FILT + TOUCH (up to 43.5 GHz)
- MiniCircuits SSG-30G-RC
- Berkeley Nucleonics Model 865 + FILT (up to 40GHz)
- Keysight N5183B
- Anritsu MG3695C or MG36241A
- Siglent SSG5085A
- Siglent SNA5032A (VNA to 26.5GHz)

#### Detector:

##### Packaged:

- Krytar 203BK
- Anritsu Model 75KC50
- Keysight 8474E + 2.4mm adapter + SMC-to-BNC adapter
- MW Devices [mwdevices.com](http://mwdevices.com), Schottky with 2.92mm on request

##### Do-it-yourself:

- ADL6010 (+ evaluation board! ADL6010-EVALZ)
- Infineon BAT62

#### Cables:

- Thorlabs KMM24
- Huber+Suhner Sucoflex 102 / 11SK / 11SK / 1000mm

**Edge Launch Connectors available from:**

- Southwest Microwave, Inc.
- WithWave
- Signal Microwave

**Modulation Coils:**

- Adafruit 2.5W Mono Amplifier
- Kemo M032S 12W Amplifier
- 0.2mm wire, 2x 10m

**Lock-In Amplifier:**

- Zurich Instruments MFLI
- Stanford Research System SR810, SR830, SR860
- Anfatec USB LockIn 250
- Dexion Magnet DXA-001C
- Signal Recovery 7230, 7265
- Femto LIA-MV-150
- Moku:Lab, Moku:Pro
- Redpitaya STEMLab or SDRlab
- OLIA (The Open Lock-In Amplifier), <https://github.com/OpenLockIn/OLIA>

**Electromagnet:**

- Xiamen Dexion DXWD-80 or DXWD-60
- GMW 5405 or 3480
- do-it-yourself

**Electromagnet Power Supply:**

- Caenels 30A 50V 1.5kW
- Dexion Magnet DX-F2030 1kW

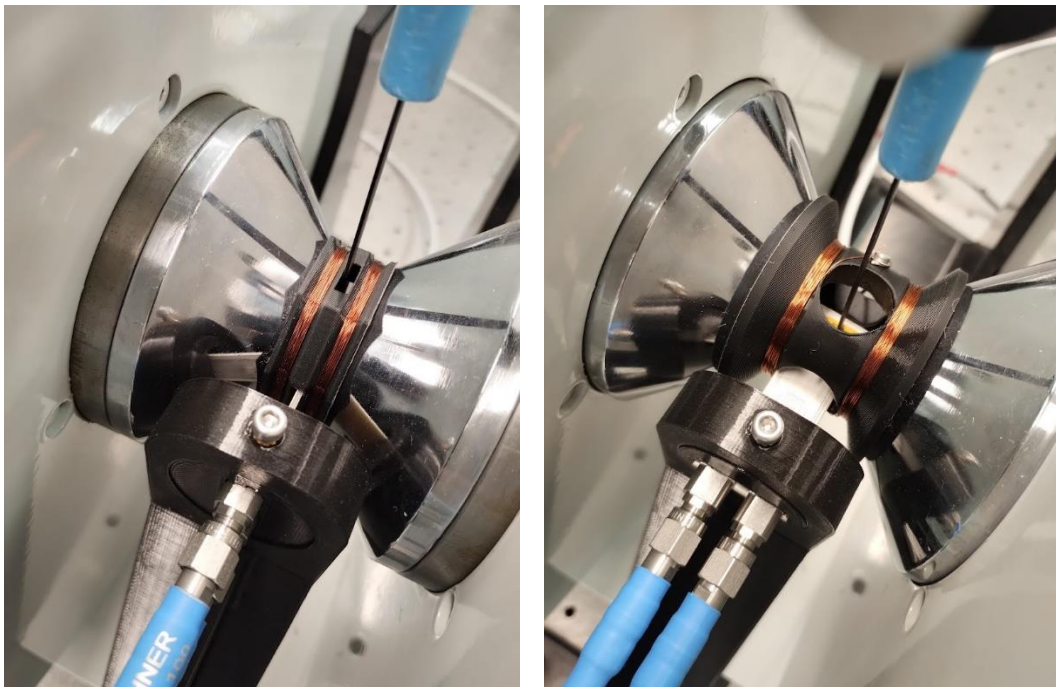
**Additional Electronics:**

- Magnet-Physik Teslameter
- Keithley DMM6500
- Sonnecy CYTP Hall Probe

## Modulation coils

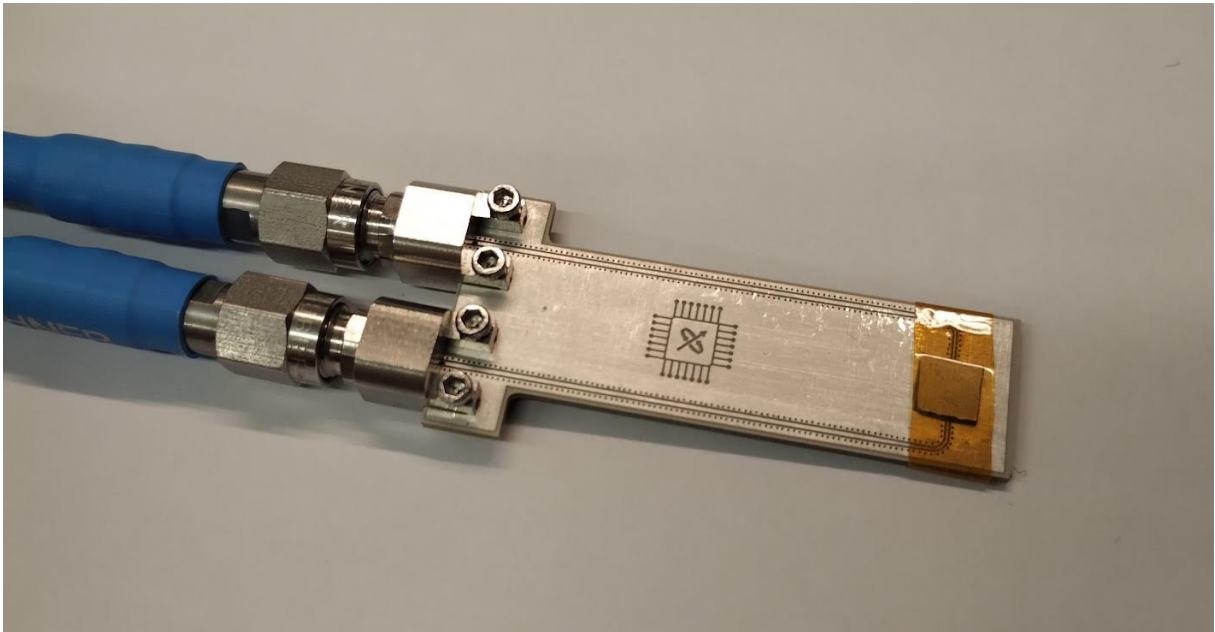


Left-hand side shows the out-of-plane modulation coil assembly, right-hand side shows the in-plane modulation coil assembly. The screws are mounted into threaded inserts.



The images show the coplanar waveguide installed in the oop- and ip-modulation assemblies inside the 80mm electromagnet. The assemblies are clamped between the magnet poles. The Hall probe coming from above is placed close to the sample. The rotatable CPW mount can be seen in the bottom-left part of the images.

## Coplanar waveguide



The image shows the sample mounted upside-down on the waveguide. Adhesive Kapton tape is used for fixing the substrate to the waveguide to hold it in position for the out-of-plane measurement.