YIG Filters Tune From 3 To 40 GHz

These four-stage filters provide the excellent linearity and frequency stability needed by high performance test equipment.

FILTERS based on yttrium-iron-garnet (YIG) tuning are noted for their excellent linearity and good image rejection. For that reason, they are often used as preselectors in a spectrum analyzers. While YIG filters have traditionally been limited in total bandwidth to approximately 26 GHz, the MLFP series of YIG-tuned filters from Micro Lambda offers coverage as wide as 3 to 40 GHz in a single unit (see figure). The four-stage filters promise high selectivity for a wide range of applications, including wideband receivers and test equipment.

The MLFP series currently has two members: the model MLFP-43040, which tunes from 3 to 40 GHz, and the model MLFP-47040, which tunes from 7 to 40 GHz. Both are four-stage designs with 24 dB/octave typical selectivity (see table). The maximum insertion loss for either model is 6 dB while the maximum passband VSWR is 2.0:1. Both exhibit 80 dB minimum off-resonance isolation and off-resonance spurious performance of −60 dBc or better.

The MLFP-43040 features a minimum passband of 33 MHz at the low-frequency bandwidth and a minimum passband of 75 MHz at 40 GHz. The former provides limiting at an input level of +10 dBm while the latter similarly provides limiting at input signals of +10 dBm or more. For the MLFP-43040, temperature drift is less than 17 MHz at 3 GHz and less than 35 MHz at 40 GHz. For the MLFP-47040, temperature drift is less than 21 MHz at 7 GHz and less than 38 MHz at 40 GHz.

The resonant frequency of a YIG-tuned device changes in response to an applied current, which alters a magnetic field around one or more YIG sphere resonators. The tuning sensitivity characterizes the responsiveness of the device to changes in current while linearity is a gauge of the tuning characteristic’s smoothness across the full applied current range. In the case of the models MLFP-43040 and MLFP-47040, the nominal tuning sensitivities are 32 and 28 MHz/mA, respectively, while the maximum lineairties are ±35 and ±30 MHz, respectively.

The MLFP series of broadband YIG-tuned filters is designed for operating temperatures from 0 to +70°C. The filters require heater voltage of +20 to +30 VDC, drawing surge current of 750 mA (such as during turn-on and warm-up periods) and steady-state current of 150 mA (during normal operating conditions). Hysteresis is 50 MHz or less for both models.

Micro Lambda, Inc.
48041 Fremont Blvd.
Fremont, CA 94538
Phone: (510) 770-9221
FAX: (510) 770-9213
e-mail: mcrolambda@aol.com
Web: http://www.micro-lambda.com

![YIG Filters](image-url)

The MLFP series of YIG-tuned filters provides high selectivity and strong image rejection from 3 to 40 GHz.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>MLFP-43040</th>
<th>MLFP-47040</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency range</td>
<td>3 to 40 GHz</td>
<td>7 to 40 GHz</td>
</tr>
<tr>
<td>Bandwidth (3 dB) [min.]</td>
<td>30 + (f/GHz)</td>
<td>35 + (f/GHz)</td>
</tr>
<tr>
<td>Insertion loss (max.)</td>
<td>6 dB</td>
<td>6 dB</td>
</tr>
<tr>
<td>Selectivity (typ.)</td>
<td>24 dB/octave</td>
<td>24 dB/octave</td>
</tr>
<tr>
<td>Linearity (max.)</td>
<td>+/- 35 MHz</td>
<td>+/- 30 MHz</td>
</tr>
<tr>
<td>Off-resonance isolation (min.)</td>
<td>80 dB</td>
<td>80 dB</td>
</tr>
</tbody>
</table>

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