

**FEATURES**

- High Stop-Band Rejection
- Absorptive Design
- Can Be Cascaded for Multiple Notches
- On-Device Temperature Measurement
- Compact Form-factor
- Control and Power over USB 2.0

**Specifications**

- Tuning Range: 1100 – 1900 MHz
- Insertion Loss: 0.66 dB typical
- Return Loss: 22 dB typical

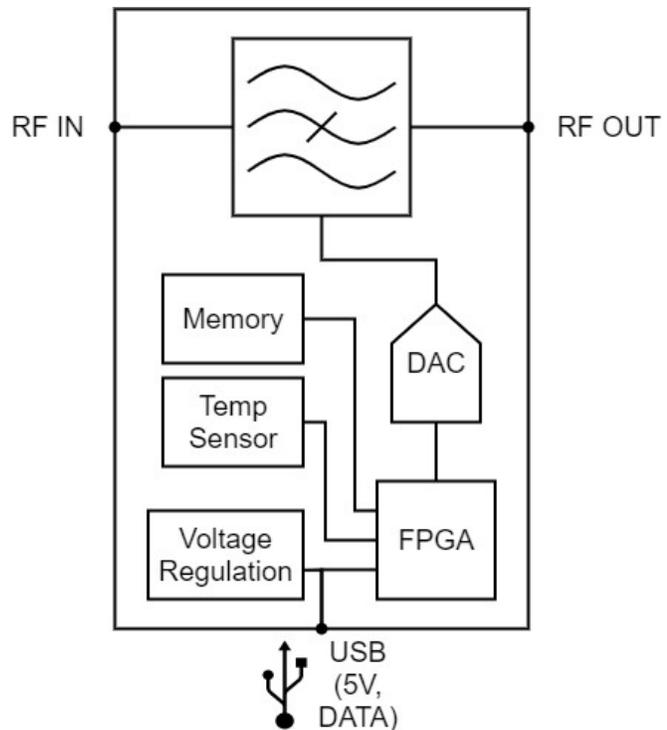
**APPLICATIONS**

- Jamming Mitigation
- Communications Receivers
- ESM Receiver Protection
- TR Modules
- Electronic Warfare

**GENERAL DESCRIPTION**

IM2104DC is a demo unit for a high-rejection, tunable, absorptive notch filter, designed and packaged to make evaluation and testing straightforward. The unit can be controlled through the provided graphical user interface or python API.

**FUNCTIONAL BLOCK DIAGRAM**



**Figure 1. Functional Block Diagram**

\*Specifications subject to change without notice

**SPECIFICATIONS**

Specifications are for the IM-DEMO-4 L-Band demo unit.

**Table 1. Electrical Specifications**

PARAMETER	TEST CONDITION/COMMENTS	MIN	TYP.	MAX	UNITS
Tuning Range		1100		1900	MHz
Tuning Resolution			1		MHz
Passband					
Frequency Range	See Note 1	686		2500	MHz
Insertion Loss	See Note 2	0.54	0.66	0.8	dB
Return Loss	See Note 3	16	22	30	dB
Group Delay	100MHz spacing from notch center frequency	1.39	2	2.77	ns
Notch Performance					
Tuning Range		1100		1900	MHz
Rejection		21	45	80	dB
-3 dB Bandwidth		173		223	MHz
-20 dB Bandwidth		17		45	MHz
Tuning Time	1100MHz to 1900MHz Tuning Time (See Note 4)			25	μs
IIP3	Passband 2-Tone Test (See Note 5)	25.29	34.32	45.25	dBm

**NOTES:**

1. Passband is defined as the frequency range between the 3 dB insertion loss points outside of the notch filter tuning range.
2. Filter insertion loss is defined as the maximum insertion loss within the passband of the notch filter tuning range.
3. Maximum return loss in the passband frequency range outside of the notch.
4. Tuning speed is approximated for this demo unit. Actual tuning speed of the filter will depend on voltage driver and control interface latency.
5. IIP3 is determined using the fundamental tone in the passband and the highest 3<sup>rd</sup> order product produced. Tone spacing of 0.5 MHz was used.

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## ABSOLUTE MAXIMUM RATINGS

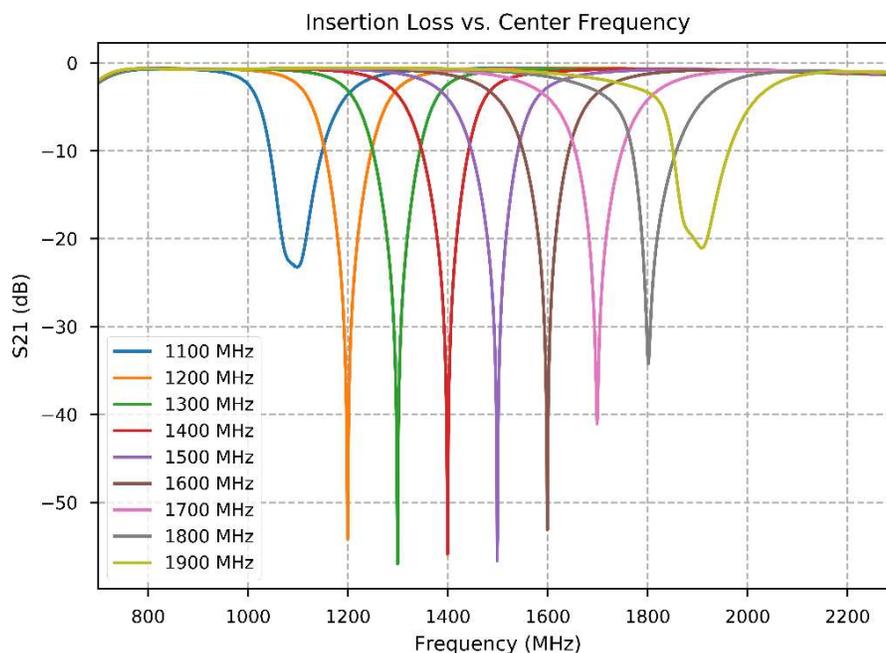
*Table 2. Absolute Maximum Ratings*

PARAMETER	RATING
Supply Voltage	5V (USB)
Passband RF Power	30dBm
Notch RF Power	-15dBm
Minimum Signal to Notch Spacing	50MHz
Ambient Operating Temperature	-40 to 60 °C
Storage Temperature	-40 to 60 °C

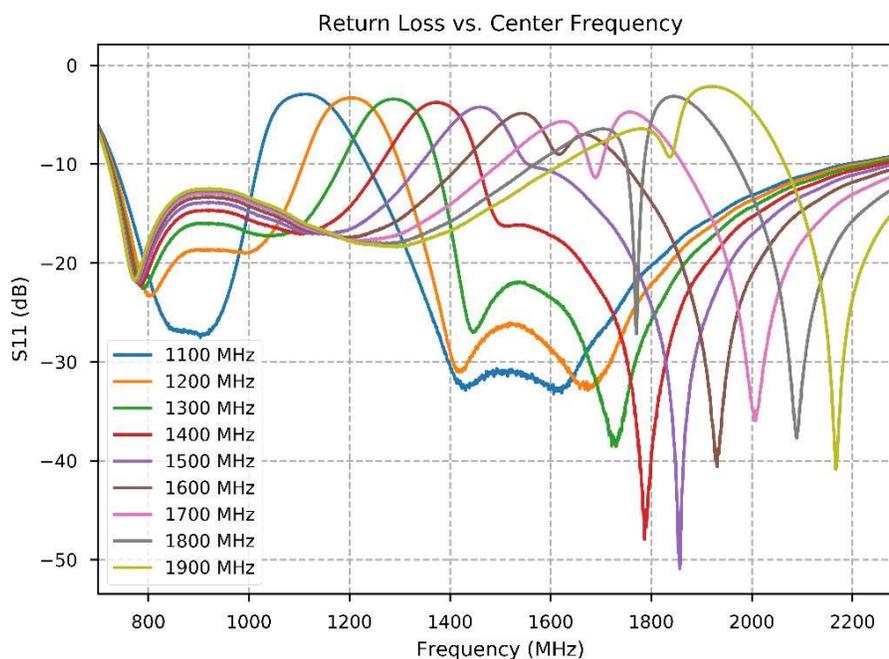
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**TYPICAL PERFORMANCE DATA**

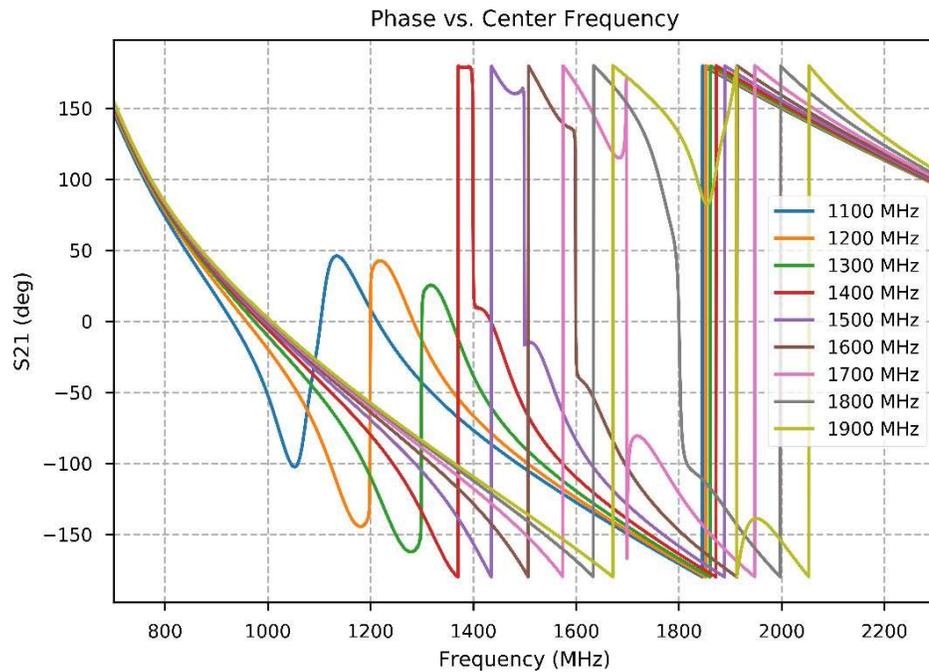


**Figure 2. Filter Insertion Loss vs Center Frequency**

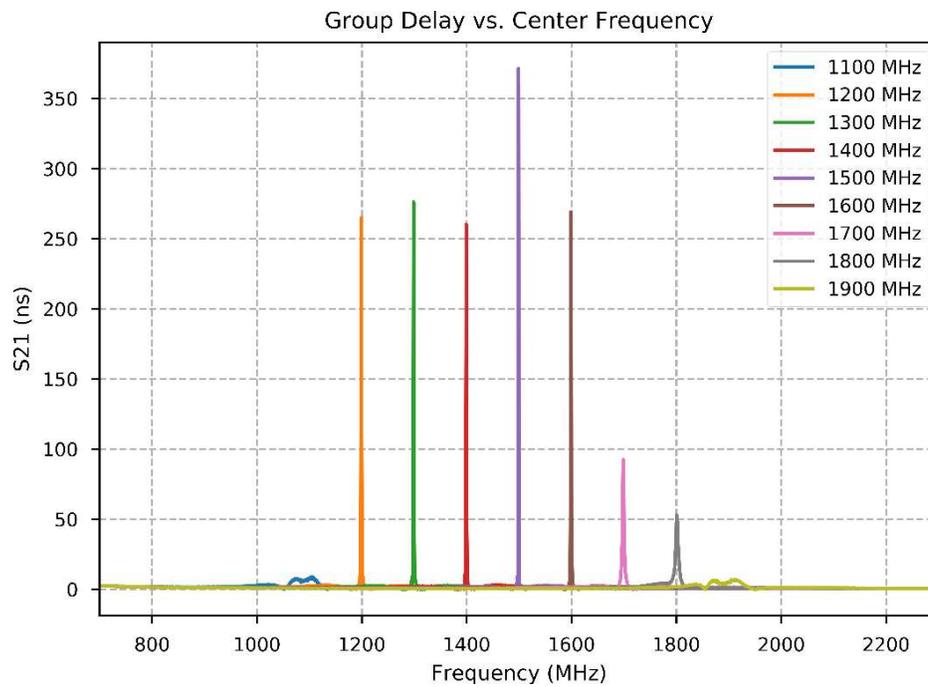


**Figure 3. Filter Return Loss vs Center Frequency**

\*Specifications subject to change without notice

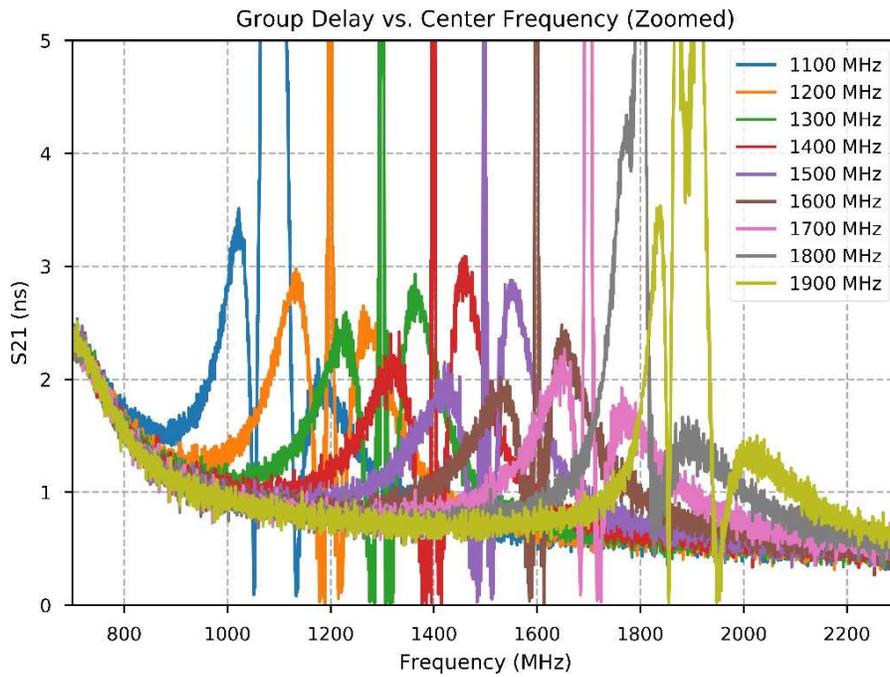


**Figure 4. Filter Phase vs Center Frequency**

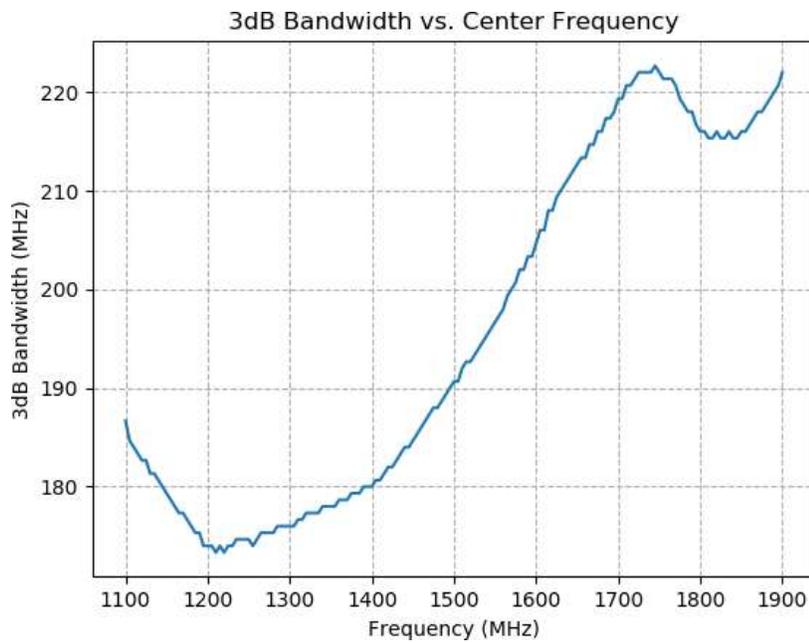


**Figure 5. Filter Group Delay vs Center Frequency**

\*Specifications subject to change without notice



**Figure 6. Filter Group Delay vs Center Frequency (Zoomed)**



**Figure 7. Notch -3dB Bandwidth vs Center Frequency**

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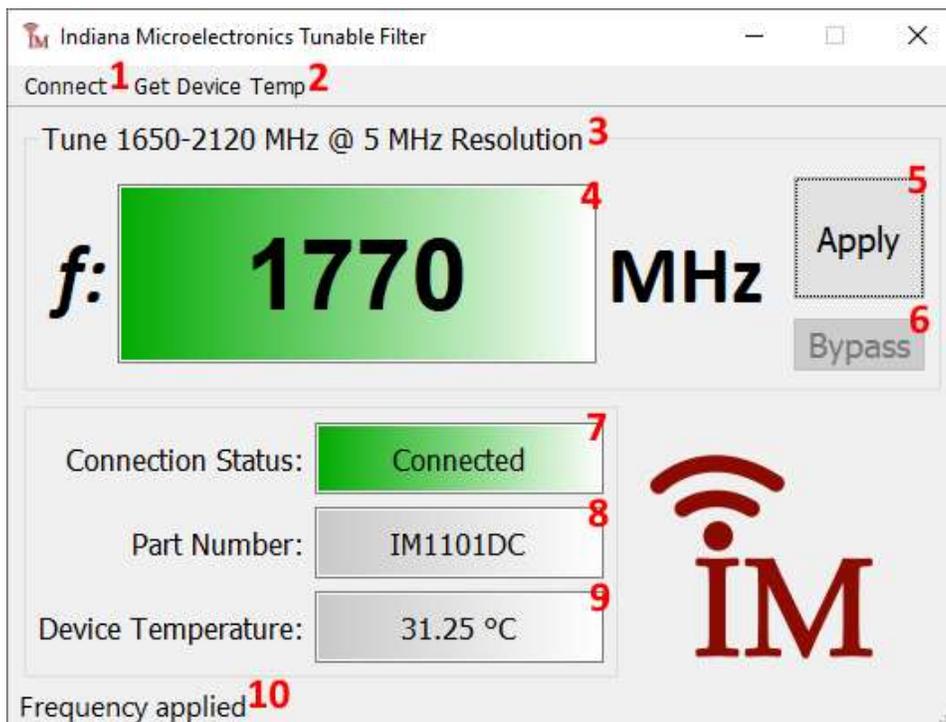
**HARDWARE INTERFACE***Table 3. Connectors*

<b>NAME</b>	<b>TYPE</b>	<b>HARDWARE</b>	<b>MANUFACTURER</b>	<b>MANUFACTURER PART NUMBER</b>
RF1	RF Input / Output	SMA Female	Amphenol RF	132146
RF2	RF Input / Output	SMA Female	Amphenol RF	132146
Power / Control	USB	USB Mini-B	Amphenol ICC	MUSB15104

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## FILTER CONTROL SOFTWARE

The IM Tunable Filter Demo unit is provided with control software for ease of testing. To run, connect the filter and the provided USB thumb drive to the same Windows machine. Launch *TunableFilter.exe*. The user interface is detailed below in Figure 8 and Figure 9:



**Figure 8. Tunable Filter Control Software**

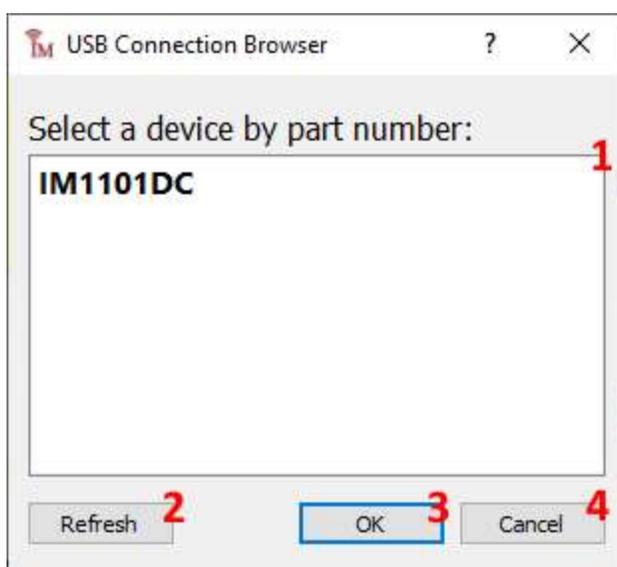
INDEX	NAME	FUNCTION
1	Connect Button	Opens the connection browser (see Figure 9, Table 5)
2	Get Temperature Button	Reads device temperature and updates respective field
3	Frequency Tuning Range(s)	Tuning range and resolution of filter. See Note 1
4	Frequency Input Field	Field to type desired frequency setpoint
5	Apply Frequency Button	Applies frequency typed in Frequency Input Field. See Note 2
6	Bypass State Enable	Applies Bypass (all-pass) state to filter, if applicable. See Note 3
7	Connection Status	Shows status of connection to Tunable Filter
8	Connected Device Part Number	Shows Part Number of connected Tunable Filter
9	Connected Device Temperature	Shows last read Device Temperature. See Note 4
10	Status Bar	Temporarily shows relevant messages and errors

**Table 4. Control Software Details**

\*Specifications subject to change without notice

**NOTES:**

1. Frequencies between and including the listed bounds at the provided resolution interval are valid. For example, 1650, 1655, 1660, etc. as shown for the example device in Figure 8. Values within the bounds but outside of provided resolution (e.g. 1653) will be automatically rounded. Note that some devices have multiple ranges of valid tune states. Values between listed ranges are invalid.
2. Pressing ENTER also applies the value in the Frequency Input Field.
3. Not all devices have a bypass state. The button is unavailable in this case.
4. Device temperature is read on initial connect but will only update when Get Device Temp is pressed.



**Figure 9. Control Software Connection Browser**

INDEX	NAME	FUNCTION
1	Discovered Device List	Shows a list of all discovered IM Tunable Filters.
2	Refresh List Button	Re-searches for available IM Tunable Filters and updates list
3	OK Button	Connects to selected part number. See Note 1
4	Cancel Button	Cancels connection attempt and closes browser. See Note 2

**Table 5. Connection Browser Details**

**NOTES:**

1. Desired Part number must be highlighted in list when pressed. Double-clicking desired serial number also initiates connection.
2. Equivalent to closing window with X button.

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