Microwave Filters

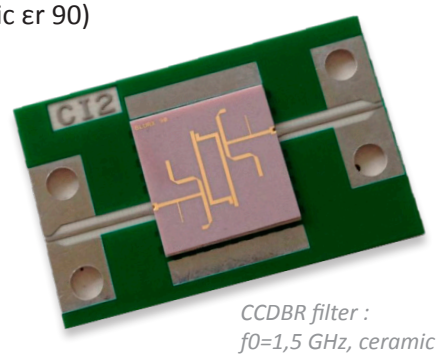
PLANAR FILTERS
SIW FILTERS
COAXIAL FILTERS
3D PRINTING

PLANAR FILTERS

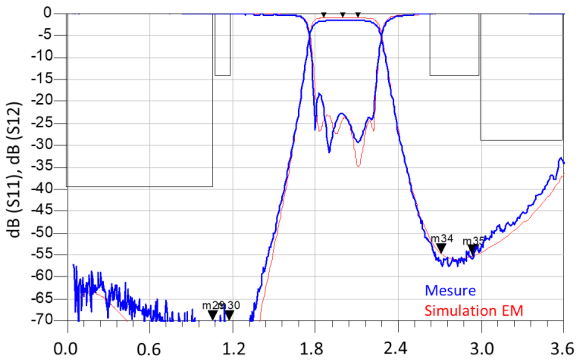
SURFACE MOUNTED PLANAR FILTERS

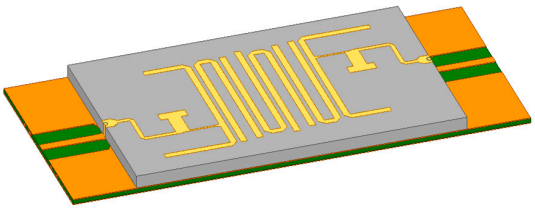
• Surface mounting of planar filters (alumina, or ceramic εr 90) by gluing (sealing) or soldering.

→ This solution makes it possible to occasionally use a passive function with a low level of losses and small footprint on a printed circuit oard.



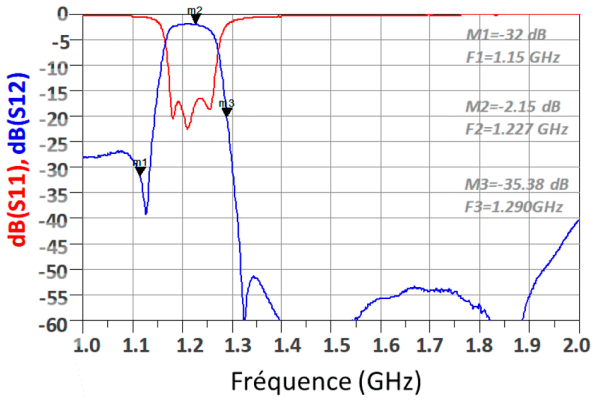
CCDBR filter :
f0=1,5 GHz, ceramic εr=90

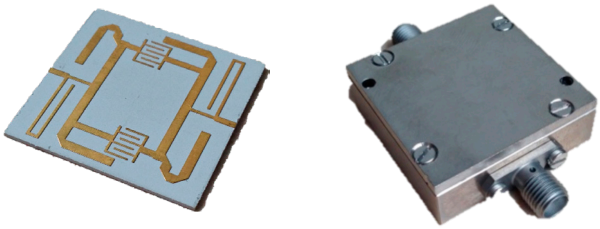




PLANAR FILTERS IN HOUSING

• Mounting of microstrip or stripline filters in connectorized housing from DC to Ka band.





CCDBR filter : f0=1,22 GHz, (Rogers 4350)

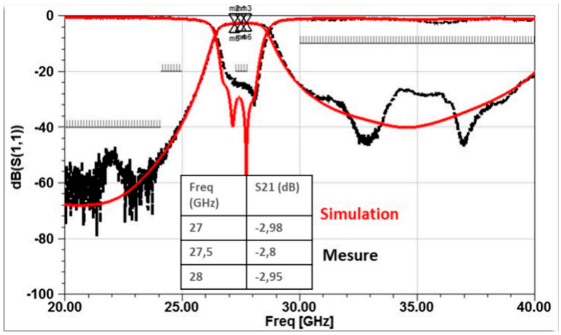
Topologies	Technologies	Function	Frequency	Relative bandwidth	Quality factor	Mounting type
▪ DBR ▪ CCDBR ▪ OC stubs ▪ SC Stubs ▪ Hairpin ▪ Open loop ▪ Coupled lines ▪ Interdigity ▪ Hybrid	▪ Alumina (εr= 9,9, tanδ=0,0005) ▪ Ceramic (εr= 90, tanδ=0,0009 ▪ Microstrip PCB (Rogers, FR4, Meg-tron6…) ▪ Stripline (Rogers)	▪ Bandpass ▪ Bandstop ▪ Low-pass ▪ Diplexer	DC – 50 GHz	From 3 to 20 % From 20 % to 100%	100 – 200	▪ SMA connectors ▪ Surface mounting ▪ Sealiing ▪ Soldering ▪ Housing

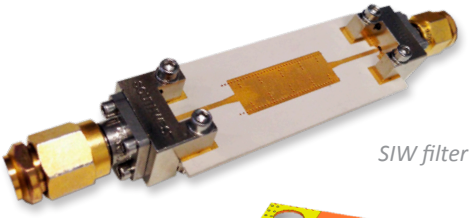
SIW
FILTERS

SIW FILTERS

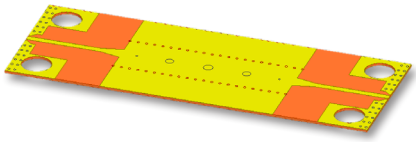
• The SIW filter is based on the use of substrate thickness in order to combine the advantages of planar and volumic technologies. The resonators are then delimited by metallized vias or metal walls.

THE PRINCIPLE IS VERY SIMPLE :
→ The manufacturing technologies are completely identical to those used for planar circuits, so there is perfect compatibility with these circuits in the same microwave system.





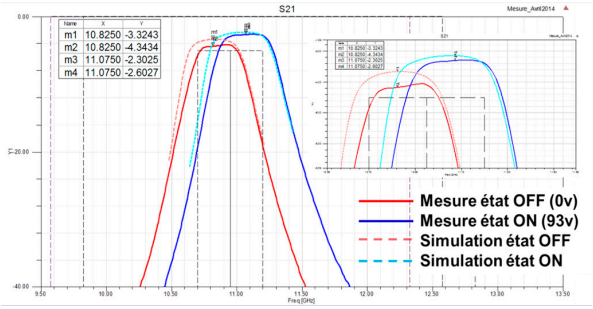
SIW filter : f0=27 GHz

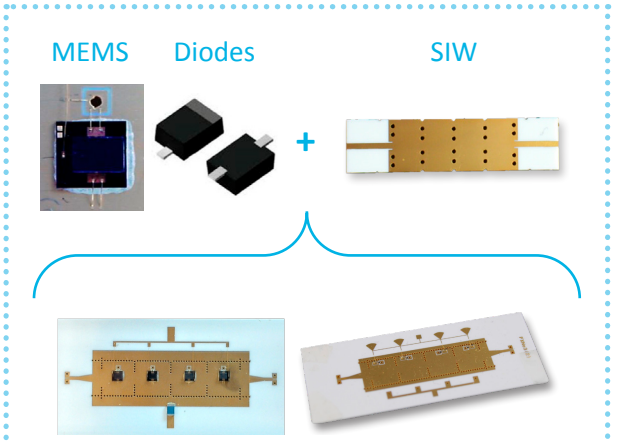


TUNABLE SIW FILTERS

• Association of SIW structures and trade surface mounted tuning components (MEMS RF, diodes (PIN, varactor)).

• Mastery of frequency excursions from X-band to Ka-band.





Tunable SIW filter (MEMS and pin diode : Xband)

SIW FILTERS	TECHNOLOGIES	FUNCTION	FREQUENCY	RELATIVE BANDWIDTH	QUALITY FACTOR	MOUNTING TYPE
SIW	▪ Alumina (εr= 9,9, tanδ=0,0005) ▪ ceramic (εr= 90, tanδ=0,0009) ▪ PCB (Rogers, FR4, Megtron6…)	▪ **Pass band** ▪ **Diplexer**	DC – 50 GHz	From 3 to 20 %	300 – 400	▪ SMA connectors ▪ Surface mounting ▪ Sealiing ▪ Soldering ▪ Housing

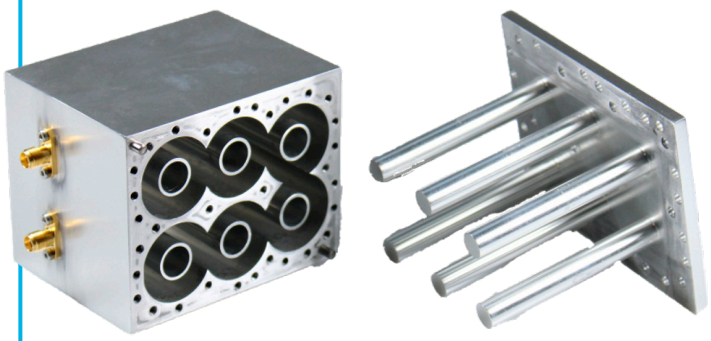
COAXIAL FILTERS

COAXIAL MATRIOCHKA FILTER

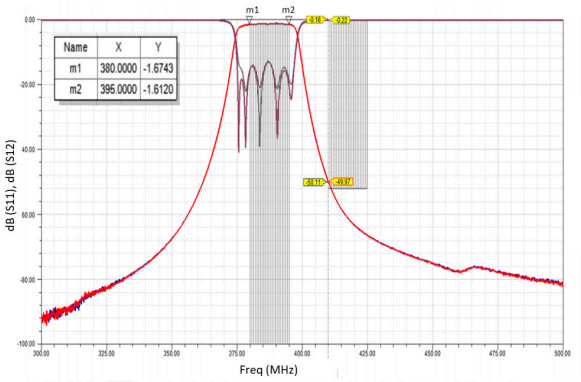
• Matryoshka coaxial resonators are based on the nesting of two coaxial stepped impedance resonator (SIR) sections within each other in order to achieve a strong reduction of the length of the resonator.

• This last makes it possible to strongly remove parasitic harmonics.

This solution has a strong interest from the VHF band to the C band

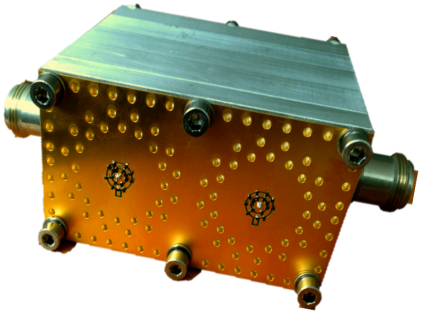


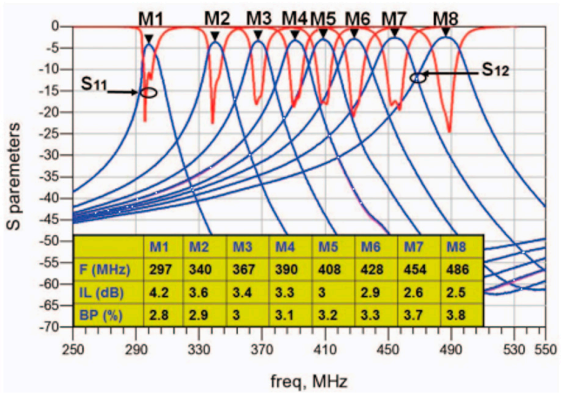
Coaxial filter : f0=380 MHz, 80x65x60 mm



TUNABLE MATRIOCHKA COAXIAL FILTER

• The Matriochka filter has a small size, good electrical performance and above all a very wide dynamic range of discrete or continuous tuning using Varactor diodes or Pin diodes in the low frequencies.

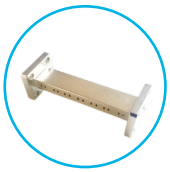




Tunable Matryochka filter (16 varicaps)
f1=297 MHz => f2=486 MHz

MATRIOCHKA FILTER	TECHNOLOGIES	FUNCTION	FREQUENCY	RELATIVE BANDWIDTH	QUALITY FACTOR	MOUNTING TYPE
COAXIAL RESONATORS	Mechanical machining	Bandpass	DC - 5 GHz	De 3 à 20 %	300 – 500	SMA and N connectors

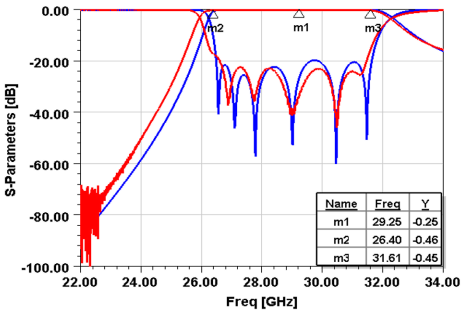
3D PRINTING



3D PRINTED | **METALLIZATION** | **WAVEGUIDE FILTER**

AUTOMATIC WAVEGUIDE FILTER DESIGN

• The automatic filter design implemented by Elliptika using Matlab and HFSS software allows the design of any waveguide filter from C-band to E-band in a very short time.



Steps before simulation of a component

01. **Customer** specifications

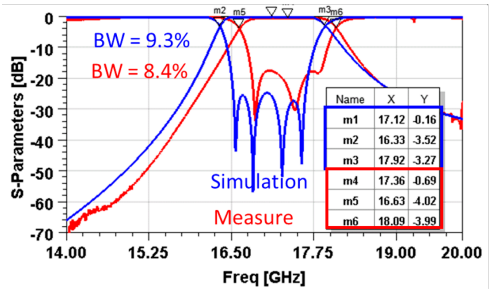
02. **Calculation of filter parameters** (MATLAB)

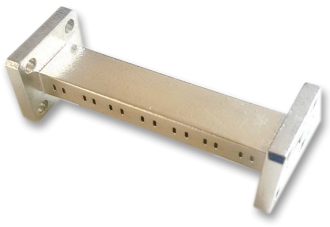
03. **automatic conversion design** (python)

04. **optimisation** and EM simuation (Ansys HFSS)

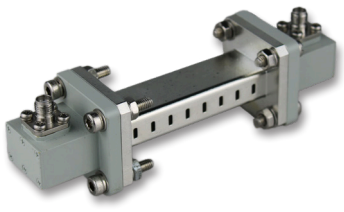
05. **visualization** of the component shape.

3D printing filters make it possible to compete in terms of price and weight with mechanical components produced by conventional machining while maintaining equivalent electrical performances.





Ka-band iris-coupled waveguide filter



Ku-band post-coupled waveguide filter

3D PRINTING FILTER	TECHNOLOGIES	FUNCTION	FREQUENCY	RELATIVE BANDWIDTH	QUALITY FACTOR	MOUNTING TYPE
TOPOLOGIES ▪ Iris coupled waveguide ▪ Post coupled waveguide	3D printing	bandpass	DC - 120 GHz	De 3 à 20 % De 20 % à 100%	>2000	▪ Connecteurs SMA, ▪ Transition WR

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