

**Ultra Fast Synthesizer**

**Ultra Low Phase Noise Frequency Source**



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## Ultra fast synthesizer

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✓ **Features :**

- High switching speed (less than 200 ns),
- Extremely short phase setting time (less than 1  $\mu$ s),
- High frequency stability,
- Low phase noise.

✓ **Applications :**

- Agile Radar,
- EW,
- Core of a more complex synthesizer,
- Etc ...



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## TEMEX: Ultra Low Noise Oscillators

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- ✓ **TEMEX modules roadmap follows a step by step approach:**
  - Step 1 : key products design
    - OCXO : 5 MHz to 15 MHz
    - OCVCXO : 50 MHz to 140 MHz
    - OCVCSO : 300 MHz to 600 MHz
    - VCO : 500 MHz to 2 GHz
  - Step 2 : Ultra Low Noise RF source
  
- ✓ **Markets**
  - Military : Radar , Communication , Missiles simulator and test bench

Ultra Low Noise Oscillator Roadmap



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## **TEMEX advantages – Low Phase Noise Osc.**

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- ✓ **Lowest phase noise available on the market ( -175 dBc/Hz )**
- ✓ **Wide frequency range : 5 MHz up to 600 MHz**
- ✓ **More than 20 years experience on both SAWs and crystal oscillators.**
- ✓ **World class piezo and electronic design team**



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## Available oscillators packaging

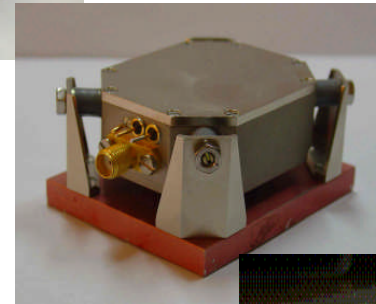
✓ A:50X50X25



✓ B:40X40X20



✓ C:50X40X20



✓ D:70X70X50



Ultra Low Noise Oscillator Roadmap

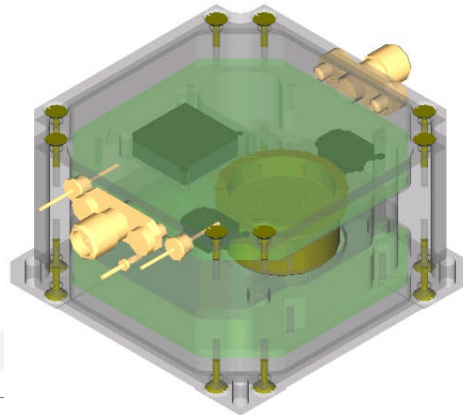


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## Customized synthesizer outline

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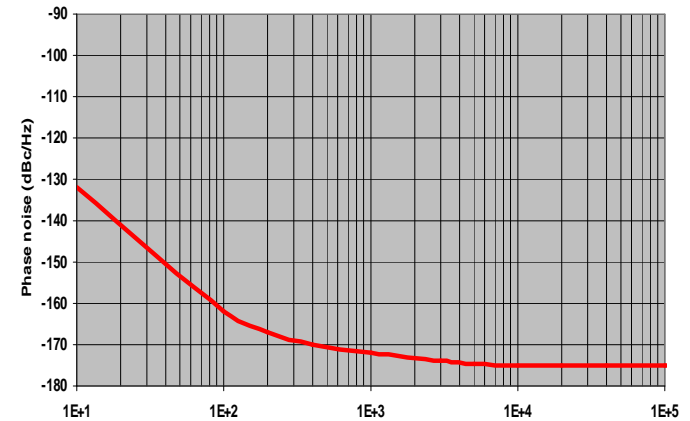
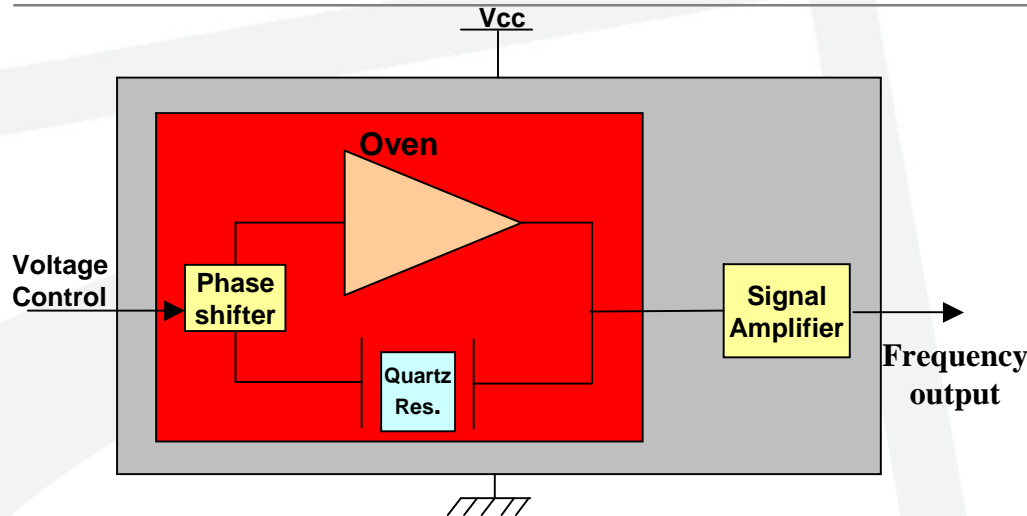
- ✓ **Machined package for severe environment**
- ✓ **SAW all quartz packaging: Optimization of g sensitivity, protection of the resonator (vaccum), monolithic component.**
- ✓ **Unique in the world.**





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## Step 1: XO 5MHz to 15 MHz



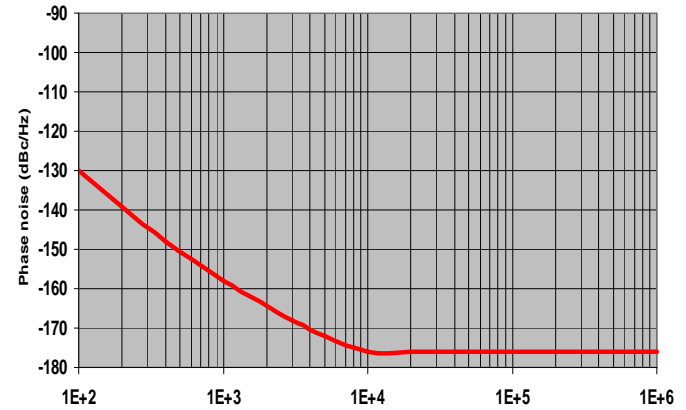
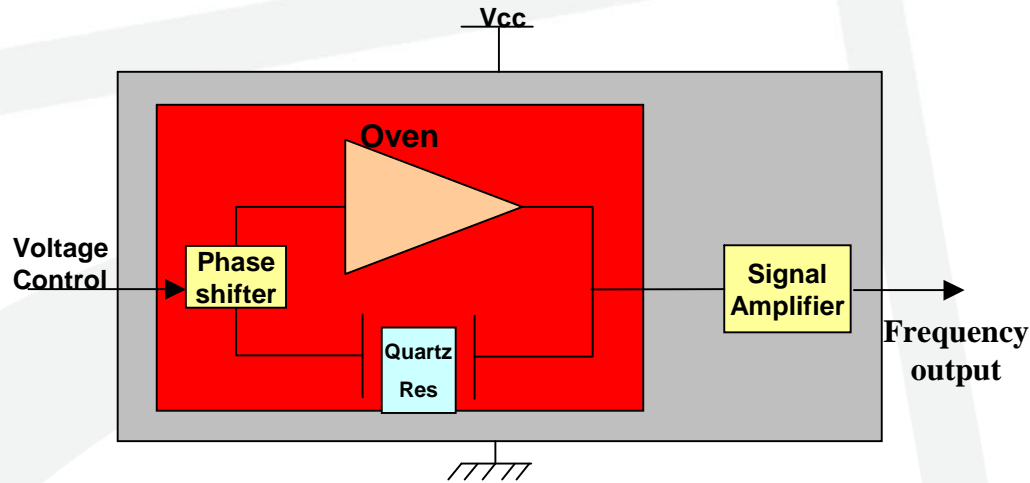
### TEMEX Solution

- 5 to 15 MHz
- High Performances: typical curve L(f) , overall 10<sup>-6</sup> over 10 years, RF power > 7dBm
- Power consumption: 5 W during warm up
- Frequency calibration : analogical or digital
- Package size: A, B, C and C.



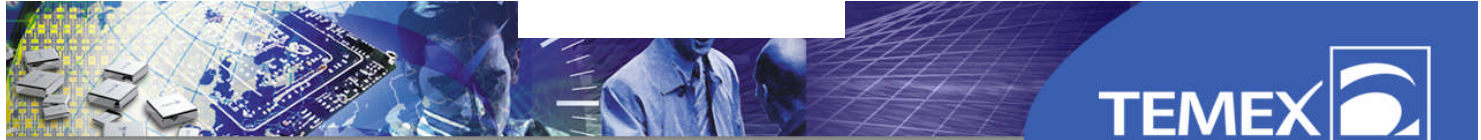
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## Step 1: XO 50 to 120 MHz



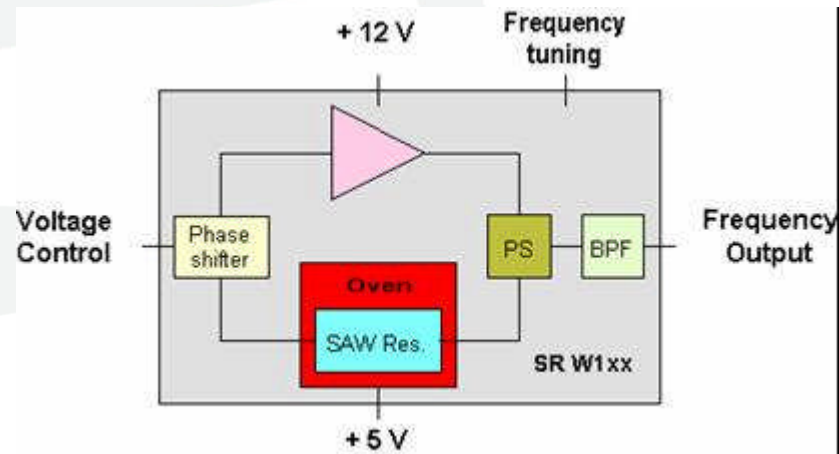
### TEMEX Solution

- 50 MHz to 140 MHz
- High Performances: typical curve  $L(f)$  , overall  $3 \cdot 10^{-6}$  over 10 years, RF power > 7dBm
- Power consumption: 5 W during warm up
- Frequency calibration : analogical or digital
- Package size: A to D



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## Step 1: VCSO Lowest phase noise on the market



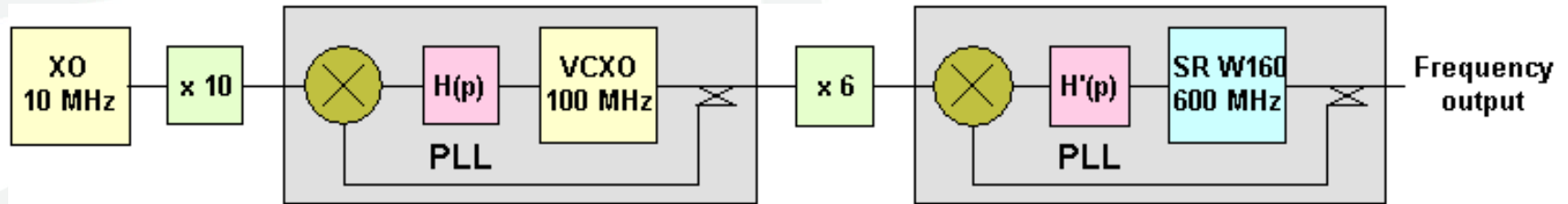
### TEMEX Solution

- 300 MHz to 600 MHz
- Phase noise: -165 dBc/Hz at 10 k Hz & -175 dBc/Hz at floor
- Frequency stability: +/- 5ppm over 10 years
- SAW resonator with all quartz package for severe environments
- Power consumption: 5 W during warm up



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## Step 2 : Ultra Low Noise RF source at 600 MHz



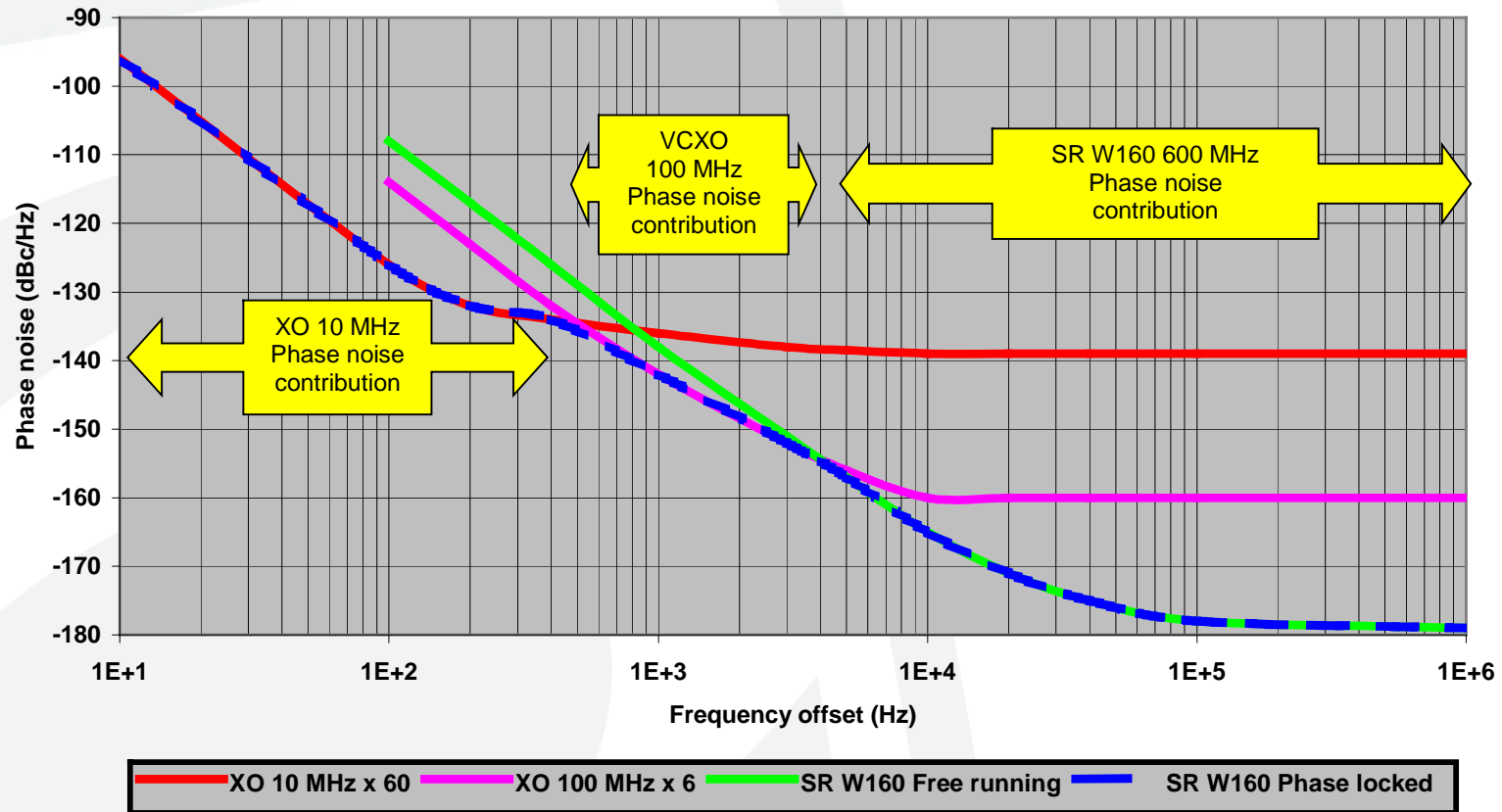
### TEMEX Solution

- Low noise OCXO at 10 MHz
- Low noise OCXO at 100 MHz
- Low noise OCSO at 600MHz
- Customized plug-in board or package



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## Step 2 Ultra Low Noise RF source at 600MHz



Ultra Low Noise Oscillator Roadmap



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## Step 3 : ULN Source Basic functions

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- ✓ **Multiplication**
- ✓ **Division**
- ✓ **PLL**
- ✓ **DDS**



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## New Ultra Low phase noise frequency source

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- ✓ **OCSO for NEW Generation of Radars**
  - High frequency : 480MHz with SAW resonators
  - Low phase noise floor: **-170dBc/Hz**
  - Land and Airborne application
  
- ✓ **Development phases foreseen:**
  - R&D report on April 2005 with measures,
  - Prototypes on October 2005 for your R&D activities,
  - During these phases Partner-Customer will be invited to provide their technical feedback

Ultra Low Noise Oscillator Roadmap



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# Ultra low phase noise oscillator

## ✓ Features :

- High frequency operation : 480 MHz
- Ultra low noise floor : > 175 dBc/Hz @ 50 kHz  
+ offset
- $1/f^3$  close-in phase noise : 145 dBc/Hz @ 1kHz  
offset
- Corner : 10kHz offset

## ✓ Applications :

- Radar
- Instrumentation

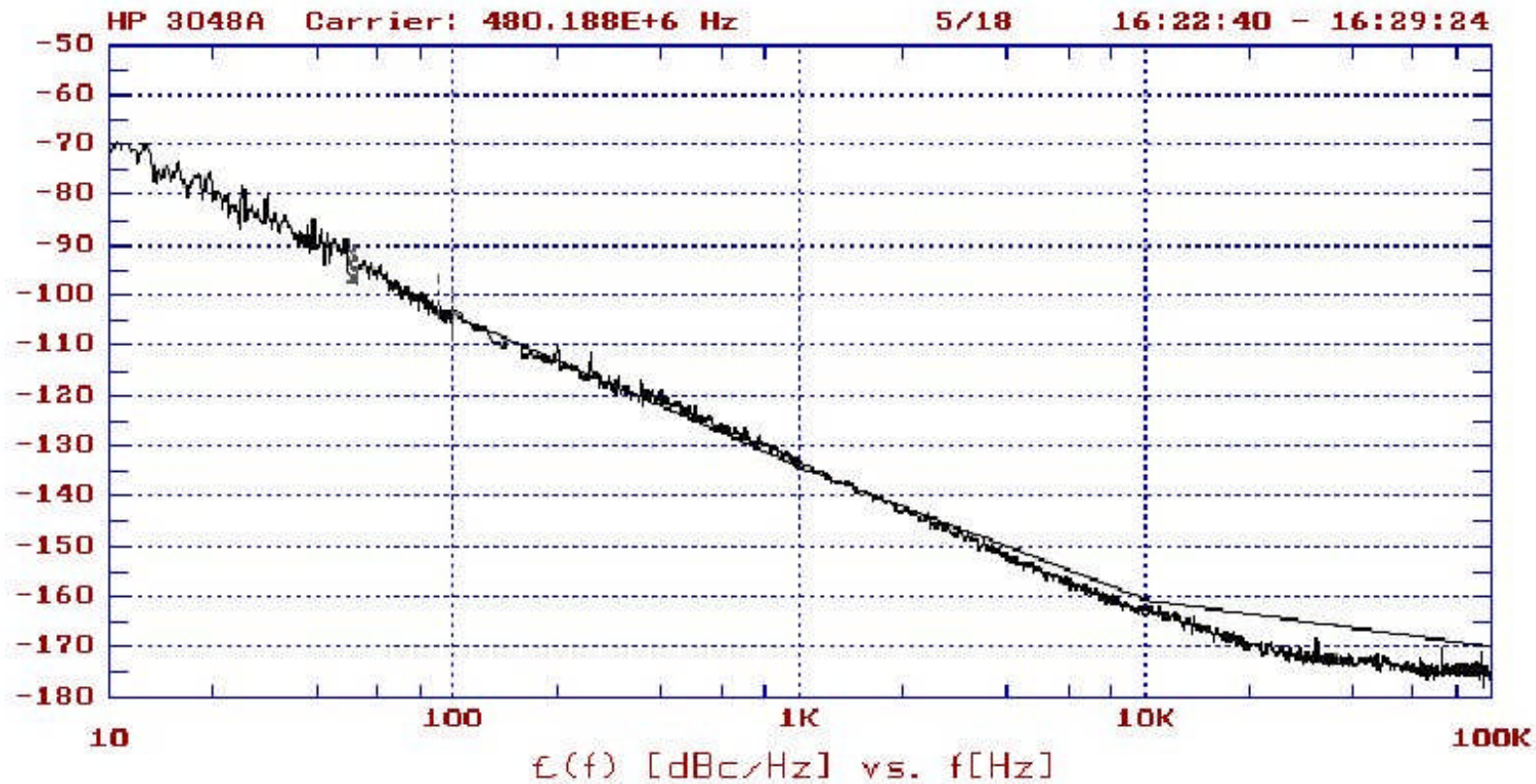


Ultra Low Noise Oscillator Roadmap



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# Phase noise measurement on OCSO (Frequency 480 MHz)



Ultra Low Noise Oscillator Roadmap