

Industrial Consultancy & Sponsored Research (IC&SR)

INJECTION LOCKED CLOCK MULTIPLIER WITH EMBEDDED PHASE INTERPOLATOR

IITM Technology Available for Licensing

PROBLEM STATEMENT

- Generally, phase interpolators are used to shift the output phase of a clock in a wide range of communication system wireline and wireless communication system. In this instance, the conventional system are **unable** to provide an effective solution to achieve low jitter and good PI resolution across the wide frequency range.
- Further there are other issues related to requirement of circuitry related to **multiphase high-frequency clock distribution, clock skewing circuit** & etc.
- Hence, there is a need to address the above issues in efficient manner.

INTELLECTUAL PROPERTY

IITM IDF Ref. 2138; IN Patent No: 411893

TECHNOLOGY CATEGORY/ MARKET

Technology; Injection Locked clock multiplier-cum-phase interpolator.

Industry & Application: Electronic System & Design Manufacturing (ESDM), ICT;

Market: The global market is projected to grow at a **CAGR of 14.8%** during **2023-2027**.

TRL (TECHNOLOGY READINESS LEVEL)

TRL-4, Proof of Concept ready, tested in lab.

TECHNOLOGY

- The present invention describes an **injection locked clock multiplier** with **embedded phase interpolator**.
- The subject invention comprises a **wide range (2X) injection locked clock multiplier (ILCM)** with an **embedded phase interpolator (PI)** multiplies a **low-frequency clock** to generate a **high-frequency output**.
- The phase is shifted as desired during the clock generation itself with **2X frequency range & 1.5° -2° resolution**.

- Said **ILCM-cum-PI** realizes an **intermediate output clock phase** by digitally **controlling delays** for signals already present in a **multiphase ring oscillator**.

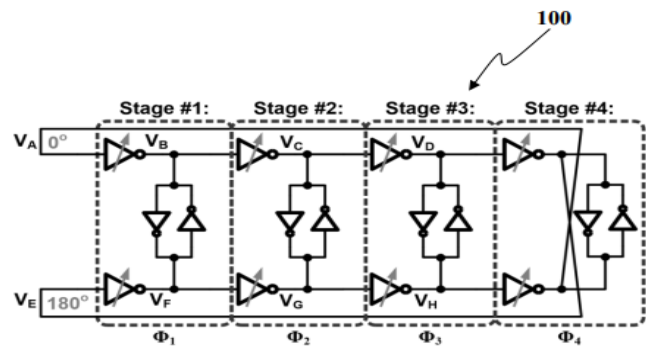


Fig. 1 illustrates a block diagram of a pseudo-differential ring oscillator (RO) implemented with an embedded phase interpolator

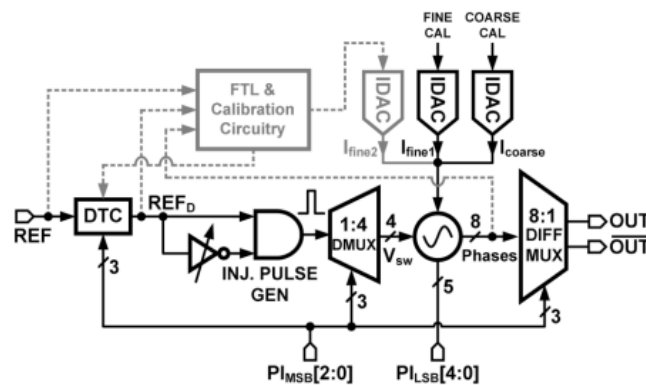


Fig.2: Illustrates block diagram (200) of the ILCM with embedded phase interpolator (PI) with frequency range (2X frequency) and resolution (1.5° -2°)

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Image

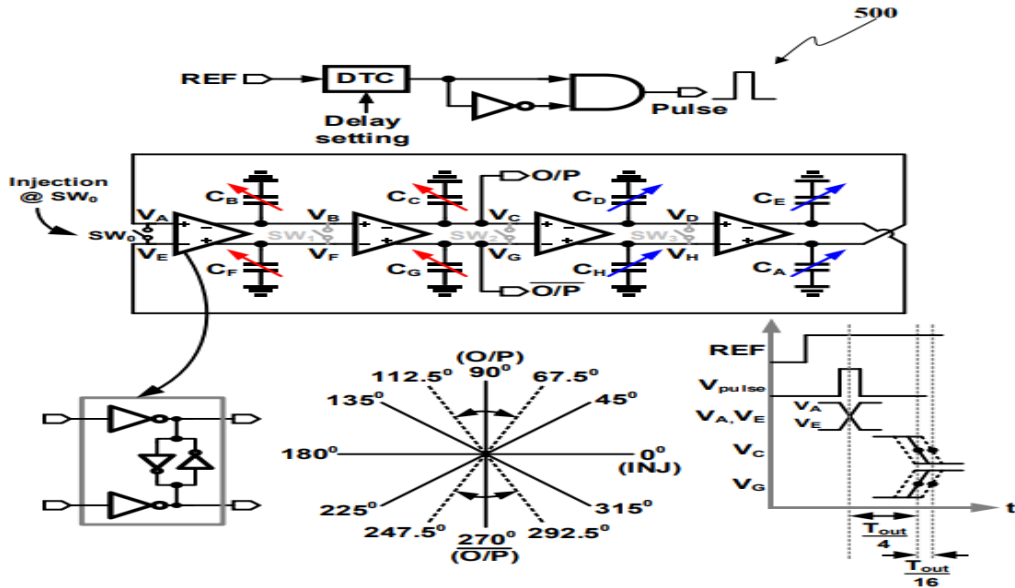


FIG. 3: illustrates an operational block diagram (500) of the ILCM-cum10 PI with tunable oscillator stages to embed the phase interpolation in accordance with the disclosed embodiments.

KEY FEATURES / VALUE PROPOSITION

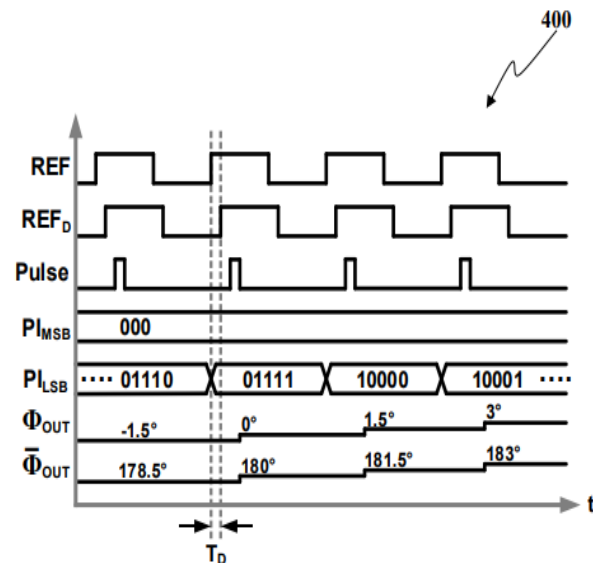
❖ Technical Perspective:

- Focused to generate an **intermediate clock phase** with **high resolution** within an oscillator by **varying the delay units** of the oscillator.
- Provides a **high frequency output** inclusive of **desired phase shift** during the clock generation itself.
- The ILCM retains the **low output clock jitter** across (**340-550fs_{rms}**) and a **good PI resolution** (**1.5°-2°**) across the **phase interpolation range** by **eliminating** the multiphase high frequency clock distribution during phase interpolation.
- **Four stage pseudo differential ring oscillator** used to generate **intermediate clock phases**.

❖ Industrial Perspective:

- **It's a cost-effective advanced system with power saving facility.**
- Applicable in **communication system** both **wireline** and **wireless communication system**.

Result



IG. 4 illustrates a timing diagram (400) of a single waveform for fine phase step at its output

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