

CLAIMS

1. A dynamic rotary traveling wave oscillator circuit comprising:
a plurality of multi-output spot-advancing blocks (MOSABs) forming a main-loop;
a plurality of multi-input spot-advancing blocks (MISABs) forming a sub-loop;
wherein depending on a desired division ratio, a connection connects blocks on the MOSABs and MISABs to create the desired division ratio.
2. The dynamic rotary traveling wave oscillator circuit of claim 1, wherein given m number of multi-phase input clock signals that drive the main-loop and sub-loop blocks, the largest phase delay between the multi-phase input clock signals is $(m-1/m)*2\pi$, and wherein the phase delays of the sub-loop is selected to be the second largest phase delay for an m phase clock signal, which is $(m-1/m) * 2\pi$, and wherein the phase delay of a connection from a block in the main-loop to a block in the sub-loop is the second largest phase delay for an m phase clock signal, which is given by $(m-2/m)*2\pi$.
3. The dynamic rotary traveling wave oscillator circuit of claim 1, wherein the circuit is a 13 stage circuit topology comprising 8 main-loop stages and 5 sub-loop stages.
4. The dynamic rotary traveling wave oscillator circuit of claim 3, wherein the 8 main-loop stages comprise 8 MOSABs with $7/8 * 2 \pi$ phase delay between adjacent MOSAB stages.
5. The dynamic rotary traveling wave oscillator circuit of claim 4, wherein the 5 sub-loop stages comprise 5 MISABs with $6/8 * 2 \pi$ phase delay between adjacent MISAB stages.
6. The dynamic rotary traveling wave oscillator circuit of claim 1, wherein the MOSABs and the MISABs comprise a 4-to-1 multiplexer.

7. The dynamic rotary traveling wave oscillator circuit of claim 6, wherein the 4-1 multiplexer is multiplexed to one of four outputs, spot_in1, spot_in2, spot_in5/VDD, or VDD.

8. The dynamic rotary traveling wave oscillator circuit of claim 6, wherein use of MOSABS in a divider configuration is determined based on power conservation.

9. The dynamic rotary traveling wave oscillator circuit of claim 8, wherein spot_in5/VDD can be connected to VDD or a MOSAB to conserve power.

10. The dynamic rotary traveling wave oscillator circuit of claim 1, wherein one MOSAB regulates the voltage on an adjacent MOSAB through a Spot_mid output.

11. A rotary traveling wave oscillator frequency divider circuit comprising:
a main-loop comprising 8 multi-output spot-advancing blocks SABs (MOSABs) with $7/8 * 2 \pi$ phase delay between adjacent stages;

a sub-loop comprising 5 multi-input SABs (MISABs) with $6/8 * 2 \pi$ phase delay between adjacent stages;

wherein the MOSABs and the MISABs comprise a spot advancing block and a 4-to-1 multiplexer that provides dynamic frequency tuning capability;

wherein by changing the control inputs of the multiplexer, the connections among the MOSABs in the main-loop and the MISABs in the sub-loop can be reconfigured dynamically.

12. The dynamic rotary traveling wave oscillator circuit of claim 11, wherein given m number of multi-phase input clock signals that drive the main-loop and sub-loop blocks, the largest phase delay between the multi-phase input clock signals is $(m-1/m)*2\pi$, and wherein the phase delays of the sub-loop is selected to be the second largest phase delay for an m phase clock signal, which is $(m-1/m) * 2\pi$, and wherein the phase delay of

a connection from a block in the main-loop to a block in the sub-loop is the second largest phase delay for an m phase clock signal, which is given by $(m-2/m)*2\pi$.

13. The dynamic rotary traveling wave oscillator circuit of claim 11, wherein the circuit is a 13 stage circuit topology comprising 8 main-loop stages and 5 sub-loop stages.

14. The dynamic rotary traveling wave oscillator circuit of claim 13, wherein the 8 main-loop stages comprise 8 MOSABs with $7/8 * 2 \pi$ phase delay between adjacent MOSAB stages.

15. The dynamic rotary traveling wave oscillator circuit of claim 14, wherein the 5 sub-loop stages comprise 5 MISABs with $6/8 * 2 \pi$ phase delay between adjacent MISAB stages.

16. The dynamic rotary traveling wave oscillator circuit of claim 11, wherein the MOSABs and the MISABs comprise a 4-to-1 multiplexer.

17. The dynamic rotary traveling wave oscillator circuit of claim 16, wherein the 4-1 multiplexer is multiplexed to one of four outputs, spot_in1, spot_in2, spot_in5/VDD, or VDD.

18. The dynamic rotary traveling wave oscillator circuit of claim 17, wherein use of MOSABs in a divider configuration is determined based on power conservation.

19. The dynamic rotary traveling wave oscillator circuit of claim 19, wherein spot_in5/VDD can be connected to VDD or a MOSAB to conserve power.

20. The dynamic rotary traveling wave oscillator circuit of claim 19, wherein one MOSAB regulates the voltage on an adjacent MOSAB through a Spot_mid output.