List of Phase Models' Parameters				
Parameter of the phase Model	Value	Parameter of the 4rd Gen Prototype	Value	Comment
ω_k	$2\pi \cdot 60 \cdot 10^9$ radHz	$f_k = \omega_k/2\pi$	$60 \cdot 10^9$ Hz	intrinsic SLL frequency
K_k^{VCO}	$2\pi(\cdot 100...500)$ rad MHz/V	$K_k^{\text{VCO, fine}}$	100...500 MHz/V	sensitivity of the VCO at f_{VCO}^{out}
$\tau^{\text{cc, tune}}$	$0 \ldots 30\,\text{ns}$	$\tau^{\text{cc, tune}}$	$0 \ldots 30\,\text{ns}$	cross-coupling time-delay
G_k^{PD}	3.24	G_k^{PD}	3.24	The gain of the PD
G_k^{VGA}	0.5....2	G_k^{VGA}	0.5....2	The variable gain of the VGA
G_k^{LF}	1	G_k^{LF}	$0\ dB$	loop filter gain
ω^c	$100 \ldots 800\,\text{MHz}$	ω^c	$100 \ldots 800\,\text{MHz}$	range of cut off frequency
v_k	$128 \ldots 1024$	v_k	$128 \ldots 1024$	division of the VCO's frequency
K_k	$2\pi(8.1 \ldots 162)10^7$ radHz/V	$K_k = K_k^{\text{VCO}}\, G_k^{\text{PD}} G^{\text{VGA}} G_k^{\text{LF}}/2\text{v}$	...	coupling strength

For distance=423m, where K_k^{min}, $\omega^c = 800\,\text{MHz}$, $v = 8$

$G_L(0)$	$-4.3050 \cdot 10^6$ Hz	$G_L(0) = \frac{K_k\ h'(-\Omega(\tau-\tau^f)+\beta_{kl})}{2v}$	$-4.3050 \cdot 10^6$ Hz	steady-state loop gain
$G_L(i\gamma)$	$-4.3050 \cdot 10^6 \frac{p(i\gamma)}{i\gamma}$	$G_L(i\gamma) = \frac{K_k\ h'(\Omega(\tau-\tau^f)+\beta_{kl})}{2v} \frac{p(i\gamma)}{i\gamma}$	$-4.3050 \cdot 10^6 \frac{p(i\gamma)}{i\gamma}$	loop gain

For distance=212m, where K_k^{max}, $\omega^c = 100MHz$ and $v = 4$

$G_L(0)$	$-9.24095 \cdot 10^8 Hz$	$G_L(0) = \frac{K_k\ h' - (\Omega(\tau-\tau^f)+\beta_{kl})}{2v}$	$-9.24095 \cdot 10^8$	steady-state loop gain
$G_L(i\gamma)$	$-9.24095 \cdot 10^8 \frac{p(i\gamma)}{i\gamma}$	$G_L(i\gamma) = \frac{K_k\ h'(\Omega(\tau-\tau^f)+\beta_{kl})}{2v} \frac{p(i\gamma)}{i\gamma}$	$-9.24095 \cdot 10^8 \frac{p(i\gamma)}{i\gamma}$	loop gain

Open questions, need for discussion

- divider open questions: high vs. low division, cannot have both since the resulting frequency ranges in which all components need to operate need to be designed for specific frequency regimes; arguments for high division factors – easy to be exchanged, less damping in case of wireless transmission (range, power consumption), arguments for low division factors – integrated antennas might be possible (packaging)
- $\tau^{\text{cc, tune}}$ denotes the tunable part of the cross-coupling delay realized either within every input individually (hence each unidirectional connection can be controlled independently), in the output of the VCO's cross-coupling path, or...
- when asking how large the delay can be for a certain setup so that we can still synchronize robustly, we should consider to use the gain-margin measure and provide the maximum time-delays that would guarantee a phase-margin of $\{30°, 40°, 50°, 60°, \ldots\}$; is it feasible to plot phase and gain margin as a function of the delay or other parameters