```julia
@kernel function compute_signal_magnetization!(Mxy,
@Const(Mxy_init), @Const(ϕ), @Const(ϕ_indices), @Const(tp),
@Const(T2))
    i_g, j_g = @index(Global, NTuple)
    i_l, j_l = @index(Local, NTuple)

    TILE_SIZE_i = @uniform @groupsize()[1]
    TILE_SIZE_j = @uniform @groupsize()[2]
    T = eltype(tp)

    s_tp = @localmem eltype(tp) (TILE_SIZE_j,)
    s_Mxy_init = @localmem Complex{T} (TILE_SIZE_i,)
    s_T2 = @localmem T (TILE_SIZE_i,)
    s_ϕ = @localmem T (TILE_SIZE_i, TILE_SIZE_j)
    s_ϕ_indices = @localmem Int (TILE_SIZE_j,)

    if (i_l == 1)
        @inbounds s_tp[j_l] = tp[j_g]
        @inbounds s_ϕ_indices[j_l] = ϕ_indices[j_g]
    end

    if (j_l == 1)
        @inbounds s_Mxy_init[i_l] = Mxy_init[i_g]
        @inbounds s_T2[i_l] = T2[i_g]
    end

    @synchronize

    @inbounds ϕ_col_idx = s_ϕ_indices[j_l]
    @inbounds s_ϕ[i_l, j_l] = ϕ[i_g, ϕ_col_idx]

    @synchronize

    @inbounds Mxy[i_l, j_l] = s_Mxy_init[i_l] * (exp(-
s_tp[j_l] / s_T2[i_l])) * _cis(s_ϕ[i_l, j_l])
end
```