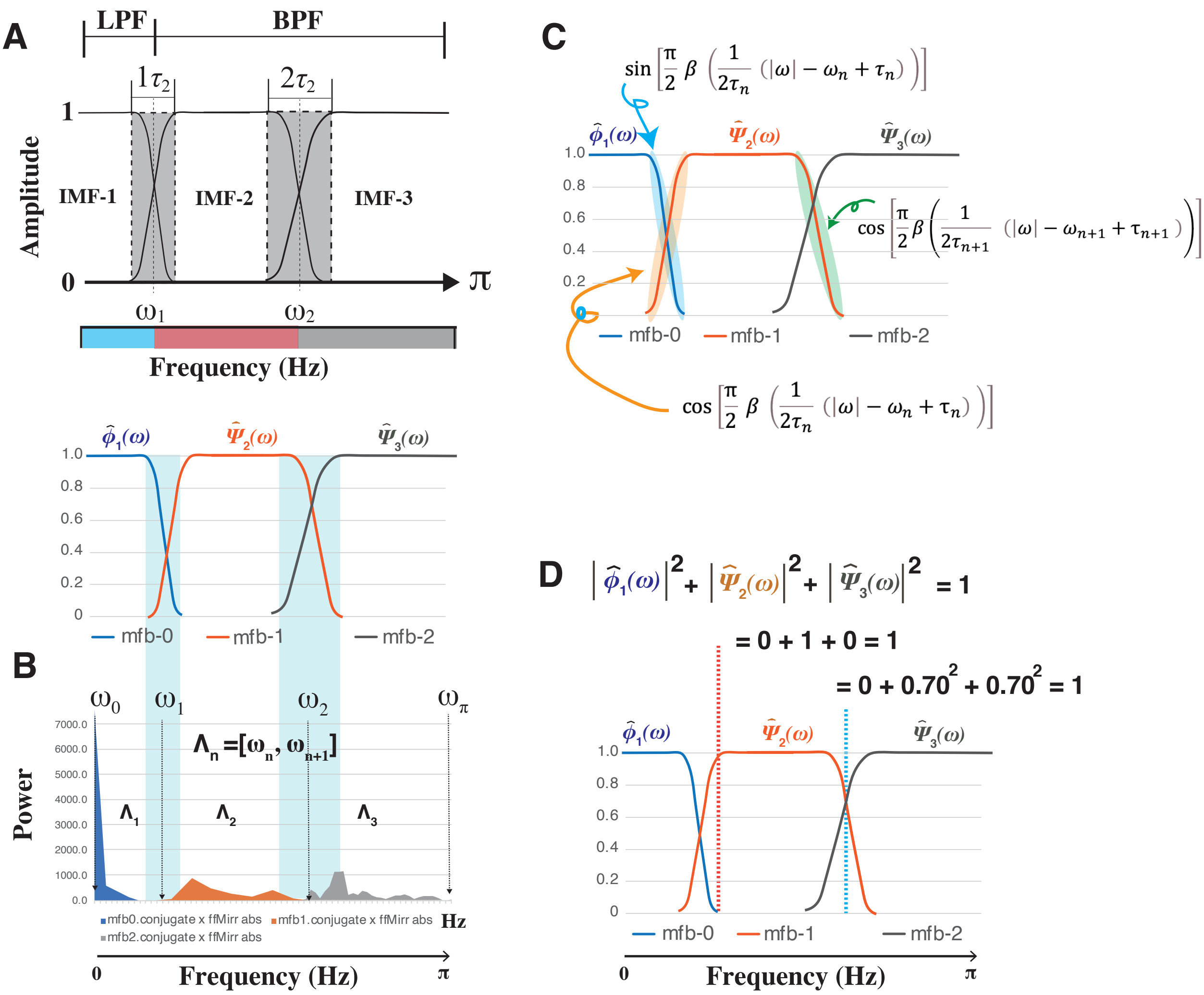

Supplementary Fig. S2 The construction of Meyer' s filter bank in emprical wavelet transform.

A) $\omega = \{\omega_i\}_{i=1,2,\ldots,N}$ (N denotes the number of maxima, and also, the number of filter banks. Assuming the frequency domain $[0, \pi]$ is divided into N consecutive segments, we need to extract N-1 boundaries excluding 0 and π (This figure shows the case of N=6). **B)** To find the boundary in the EWT, local maxima in the spectrum are found and sorted in descending order, and the boundary is defined as the average between consecutive maxima. Let ω_n be the limit between each segment (where $\omega_0=0$ and $\omega_n=\pi$), and denote each segment by $\Lambda_n = [\omega_{n-1}, \omega_n]$, then $\cup^{N}_{n-1} \Lambda_n = [0, \pi]$.

C) A scheme explaining eq.2 & eq.3. **D)** A tight frame constructed by Meyer' s wavelet with a set of $\{\phi_1(t), \{\psi_n(t)\}^{N}_{n=1}\}$ explaining eq.7. $\varphi()$: scale function, $\psi()$: wavelet function, β: beta function $\beta(x)= x^4(35-84x+70x^2+20x^3)$ (eq.5), τ: transition phase, ω: the limit between each segment (where $\omega_0=0$ and $\omega_n=\pi$). BPF: band-pass filter, IMF: intrinsic mode function, LPF: low-pass filter, Mfb: Meyer wavelet filter bank.