ON A CLASS OF POLYNOMIALS RELATED TO BARKER SEQUENCES

We will give a talk on the joint paper by P. Borwein, S. Choi and J. Jankauskas entitled "On a class of polynomials related to Barker sequences" (to appear in *Proceedings of Amer. Math. Soc.*).
For an odd integer $n > 0$, we introduce the class $\mathcal{L}P_n$ of Laurent polynomials

$$P(z) = (n+1) + \sum_{\substack{k=1 \\ k\text{ – odd}}}^{n} c_k(z^k + z^{-k}),$$

with all coefficients c_k equal to -1 or 1. Such polynomials arise in the study of Barker sequences of even length – integer sequences having minimal possible autocorrelations. Inspired by the results of numerical computations, we conjectured that minimal Mahler measures in the class $\mathcal{L}P_n$ are attained by the polynomials $R_n(z)$ and $R_n(-z)$, where

$$R_n(z) = (n+1) + \sum_{\substack{k=-n \\ k\text{ – odd}}}^{n} z^k$$

is a polynomial with all coefficients $c_k = 1$. We have proved that these polynomials $R_n \in \mathcal{L}P_n$ have large Mahler measures, namely:

$$M(R_n) > n - \frac{2}{\pi}\log n + O(1).$$

We are now able to prove our earlier conjecture. Moreover, it turns out that these polynomials have other interesting extremal properties. Our results suggest one possible approach to the long standing problem of Barker sequences.