

PROIECT PS

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1. Caracteristici ale unui filtru numeric

Secventa pondere este, de regula, provenita din cea a unui filtru ideal stabil, deci de la un semnal de durata infinita, stabil.

Spectrul raspunsului in frecventa este realizabil fizic, filtrul fiind si cauzal.

Cu cat panta de taiere este mai abrupta, cu atat creste riscul aparitiei fenomenului Gibbs(oscilatii pe palierul lobului principal).

Faza raspunsului in frecventa este de dorit sa fie liniara.

2. Metoda celor mai mici patrate(MCMMP)

Se bazeaza pe Teoria regresiei liniare, initiate de Carl Gauss si este o metoda extreme de utilizata in inginerie, pentru a “pseudo-rezolva” sisteme liniare incompatibile.

Un astfel de sistem apare adesea cand se incearca modelarea matematica liniara a unui set de date, dar modelul are un numar de parametric necunoscuti mult mai mic decat numarul datelor.

Ideea lui Gauss: Sa incercam sa gasim modelul care “trece cel mai bine printre date.”

- Se construiesc matricea de inversat.
- Daca matricea nu este inversabila, se opreste algoritmul si se sare direct la datele de iesire.
- Se construiesc vectorul liber.
- Se proiecteaza filtrul optimal.
- Se evalueaza performanta filtrului optimal.

3. Cebisev

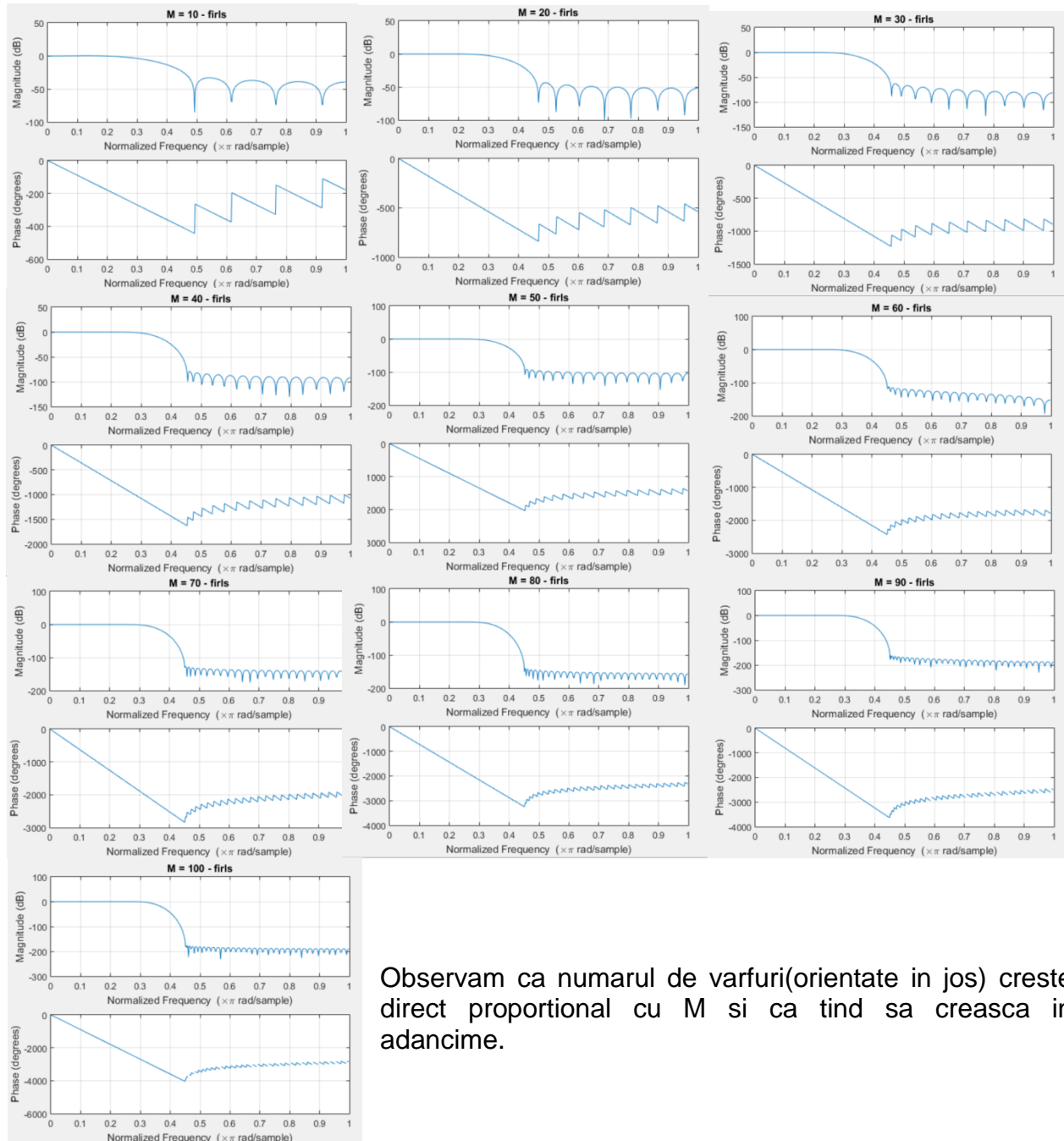
Parks & McClell: Teorema alternarii(Cebisev): nu se pot determina mai putin de $(K - 2)$ si nici mai mult de $(K + 2)$ extreme.

OBIECTIVE

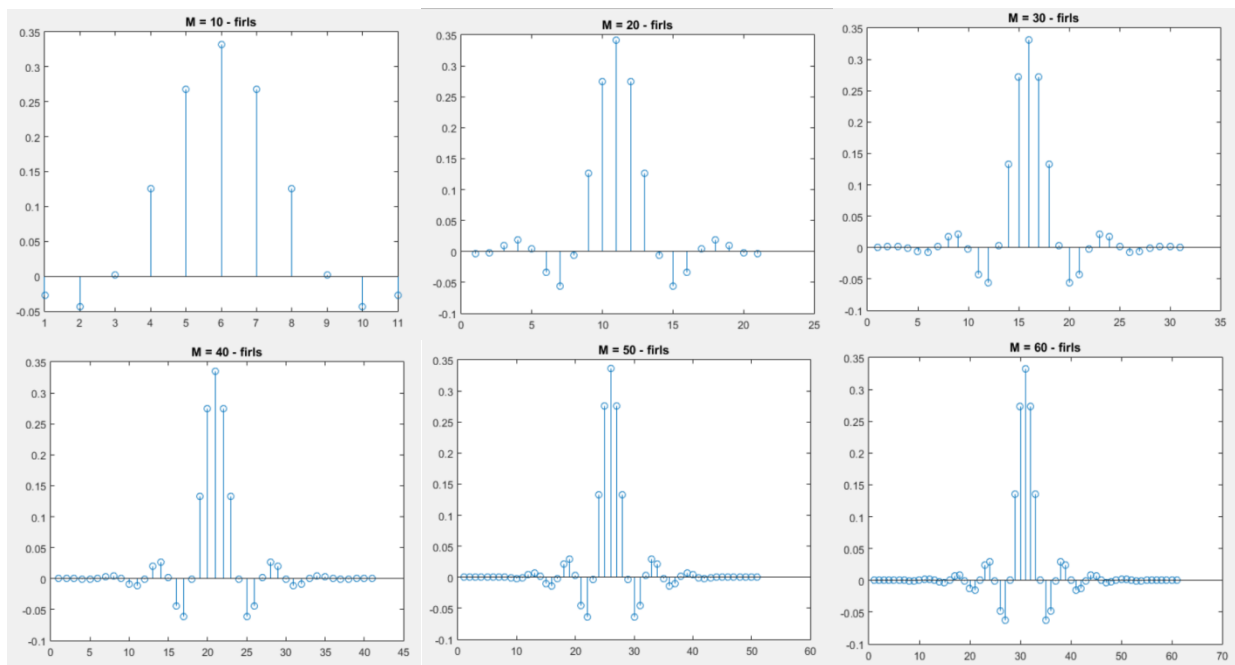
Studierea practica a doua metode de proiectare a filtrelor FIR prin optimizare, prima dupa un criteriu patratic, a doua dupa un criteriu Cebisev (minmax). Observarea diferentelor intre filtrele obtinute cu cele doua metode. Proiectarea unui algoritm pentru o problema de optimizare particulara.

FAZA 1

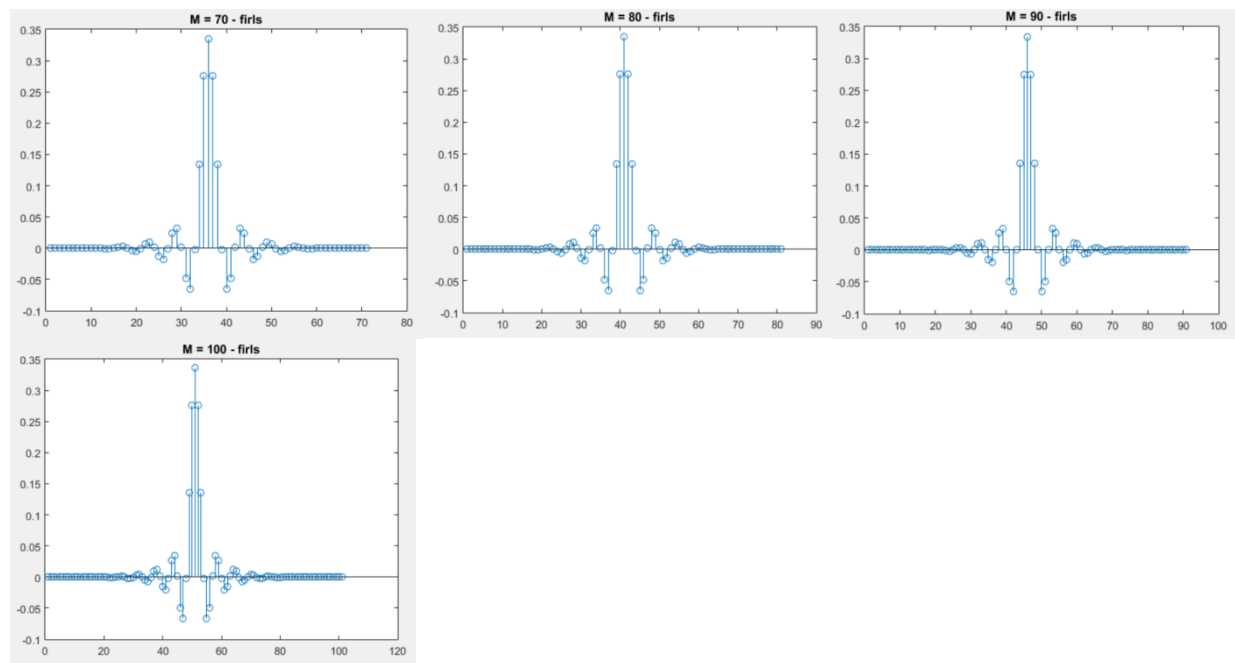
a) In prima faza am proiectat filtre FIR optime, in sens CMMP.



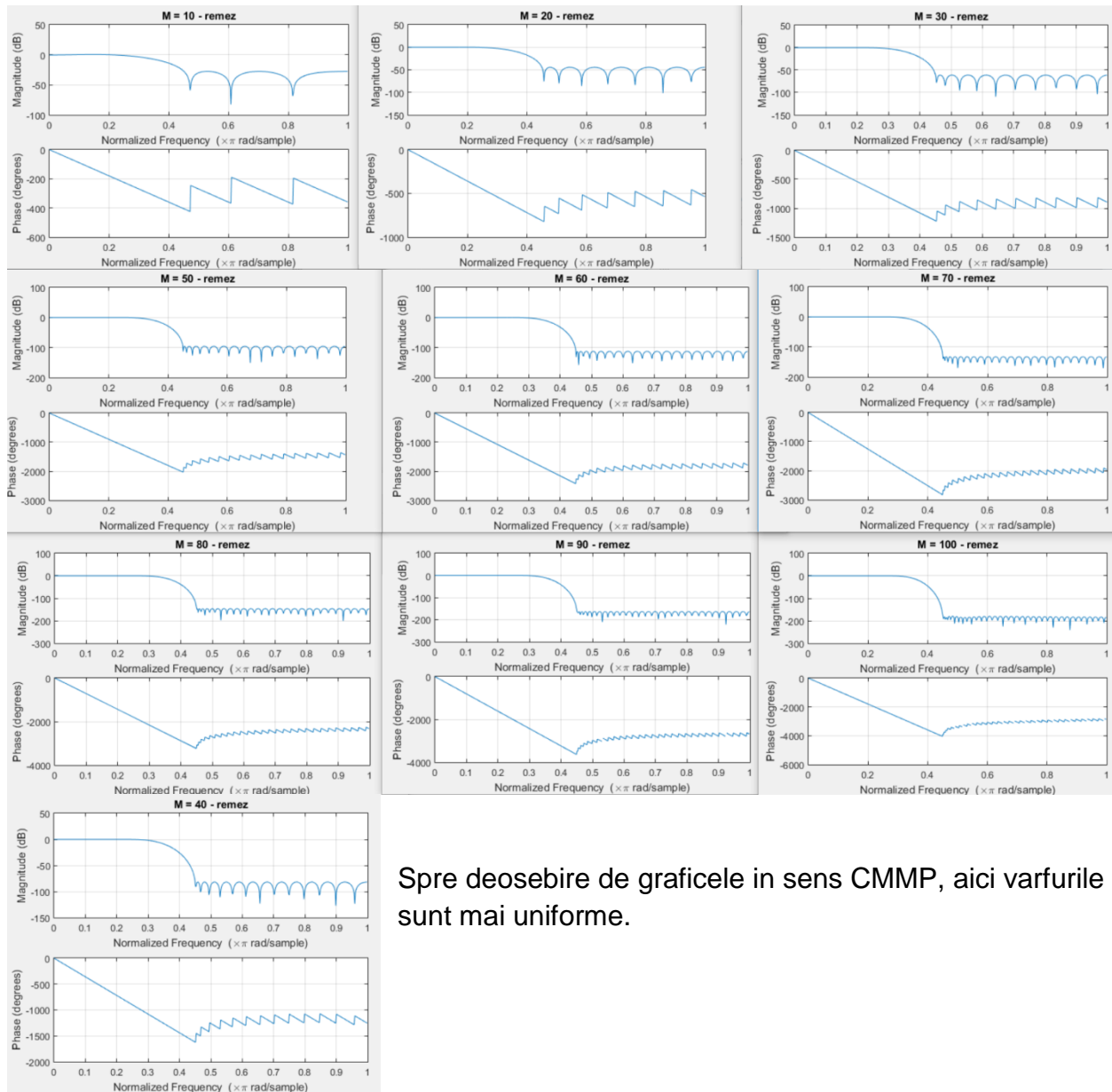
Observam ca numarul de varfuri(orientate in jos) creste direct proportional cu M si ca tind sa creasca in adancime.



Observam ca punctul maxim al graficului este aproximativ la jumatatea valorii lui M .

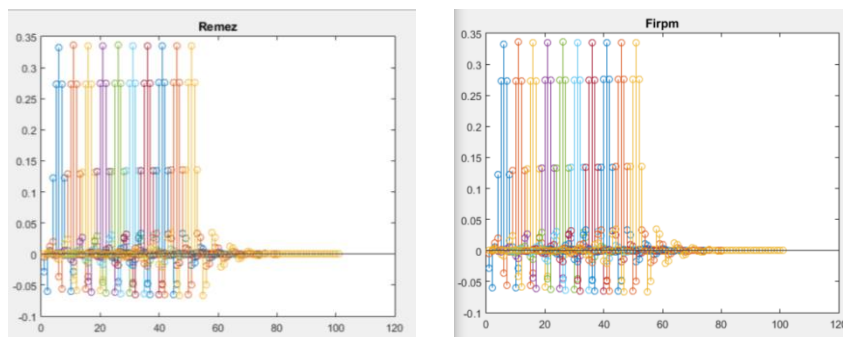


b) Filtre optime in sens infinit folosind remez si firpm

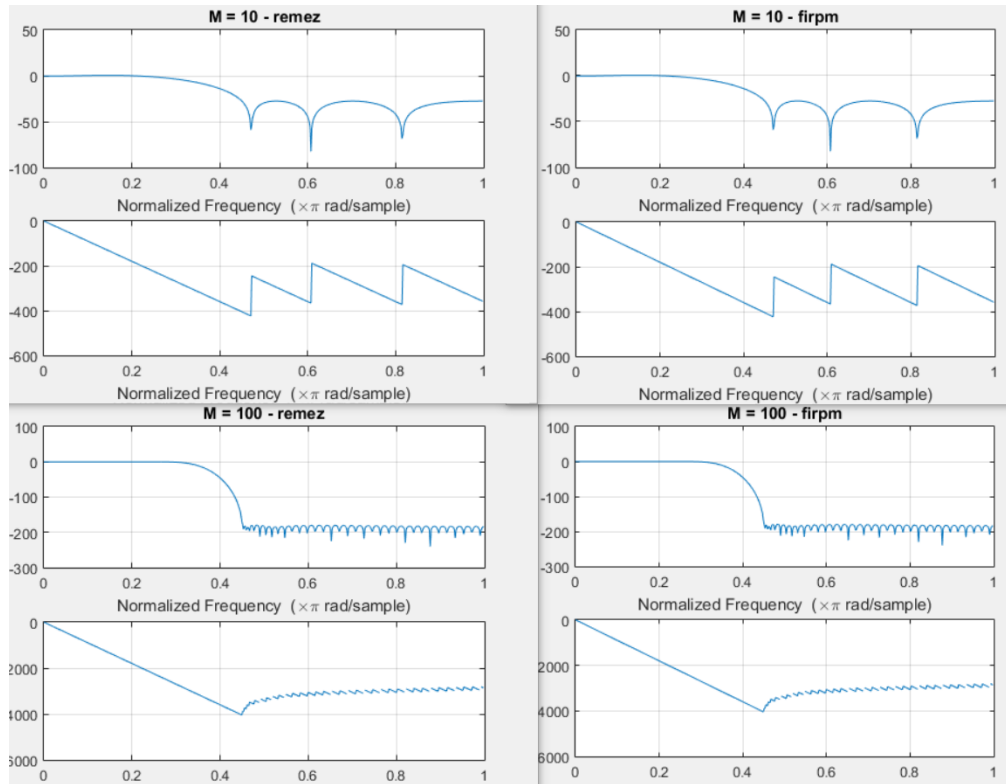


Spre deosebire de graficele in sens CMMP, aici varfurile sunt mai uniforme.

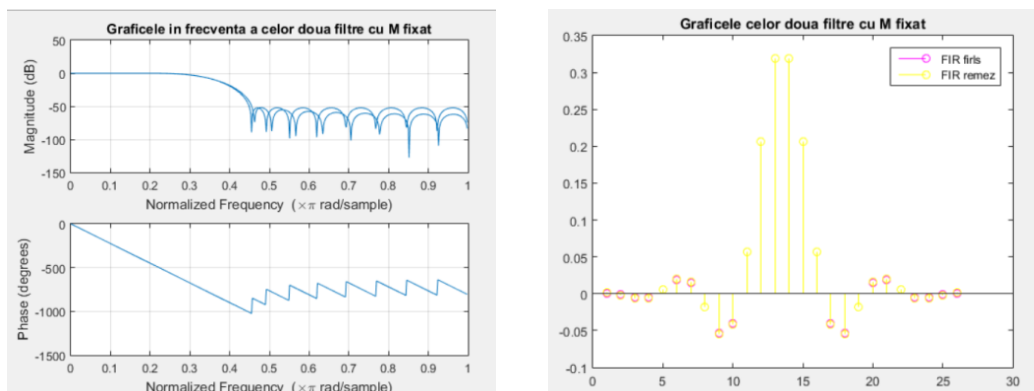
STEM



Se observa din graficele urmatoare ca atat in urma utilizarii functiei remez cat si a functiei firpm, graficele sunt identice.



c) Doua grafice: in sens CMMP si in sens infinit

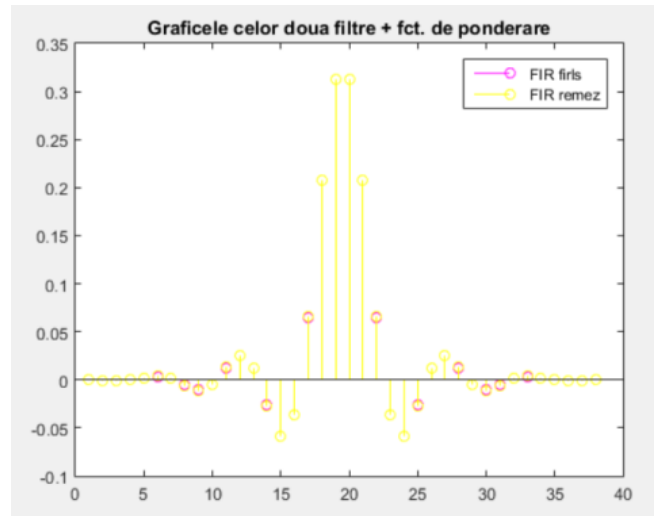
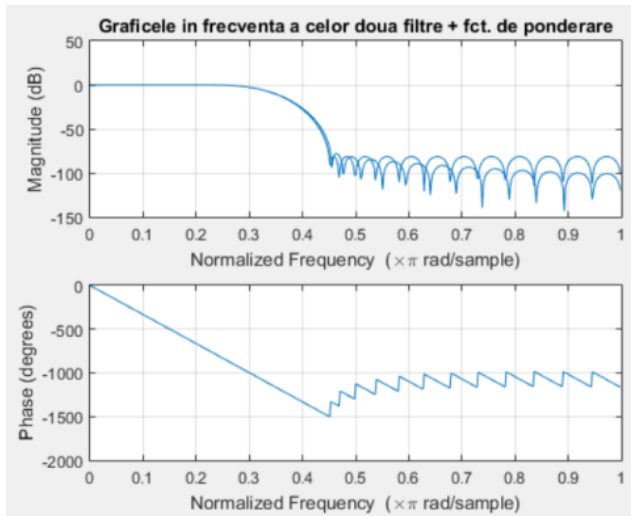


```
CMMP =
-102.5052

Inf =
-120.2776
```

Pentru aflarea atenuarii minime am cautat maximul spectrului benzii de stopare.

d) Comparatie intre cele doua tipuri de filtre



In graficele filtrelor cu functie de ponderare varfurile graficului scad treptat in adancime. De asemenea, avem mai multe varfuri decat in graficul filtrelor fara w.

Eroarea din banda de stopare trebuie sa fie mai mica decat cea din banda de trecere.

```
stopareFIRLS =
    2.2806e-05

trecereFIRLS =
    2.2438e-04
```

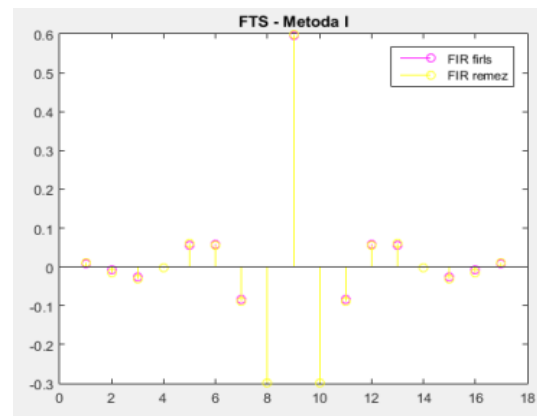
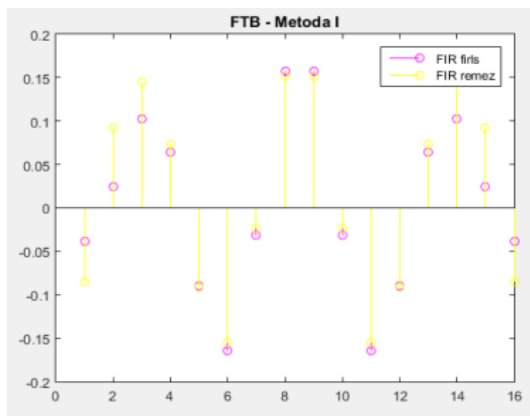
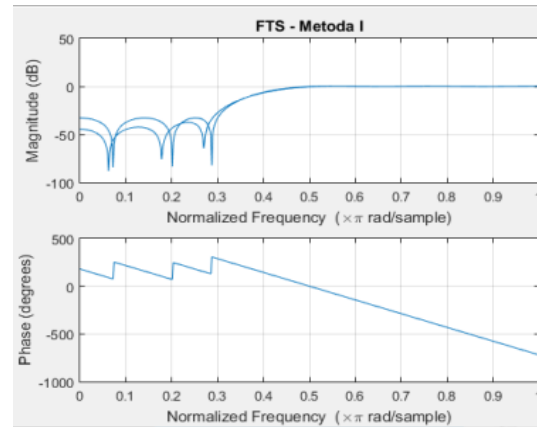
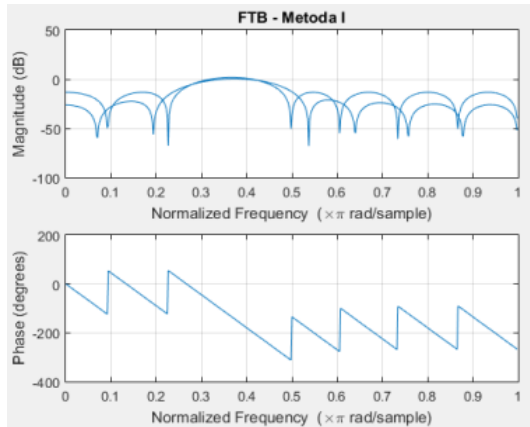
FIRLS

```
stopareREMEZ =
    2.6081e-05

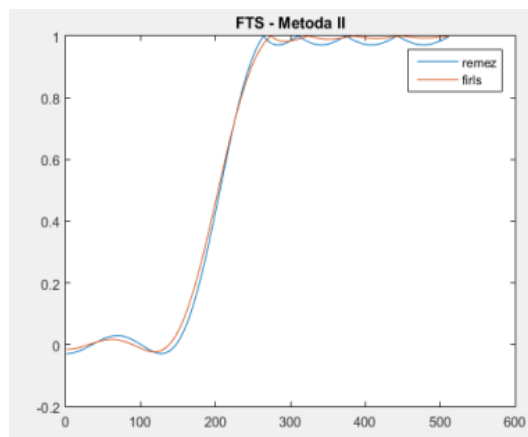
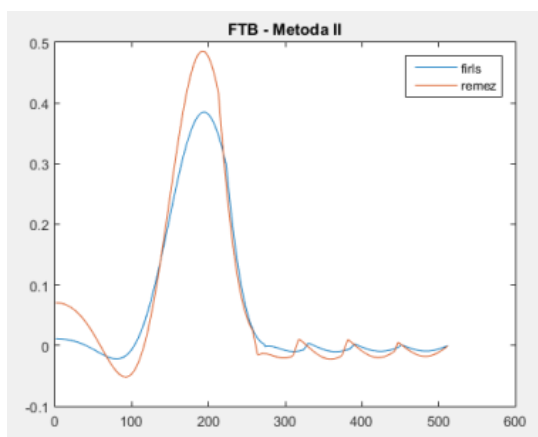
trecereREMEZ =
    3.0216e-04
```

REMEZ

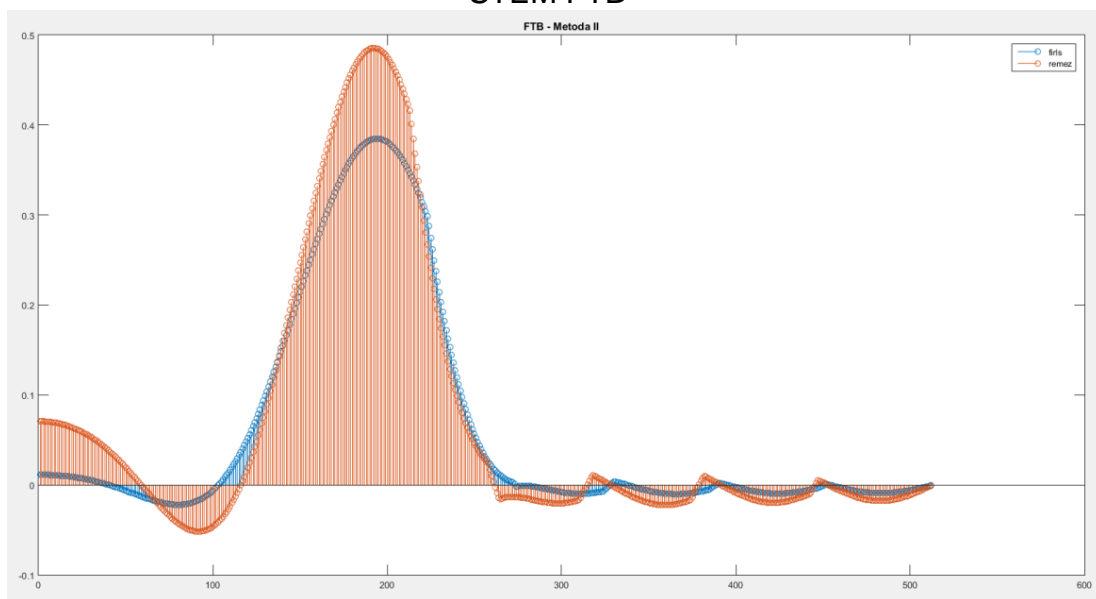
e) Metoda I – am modificat parametrii A si Omega



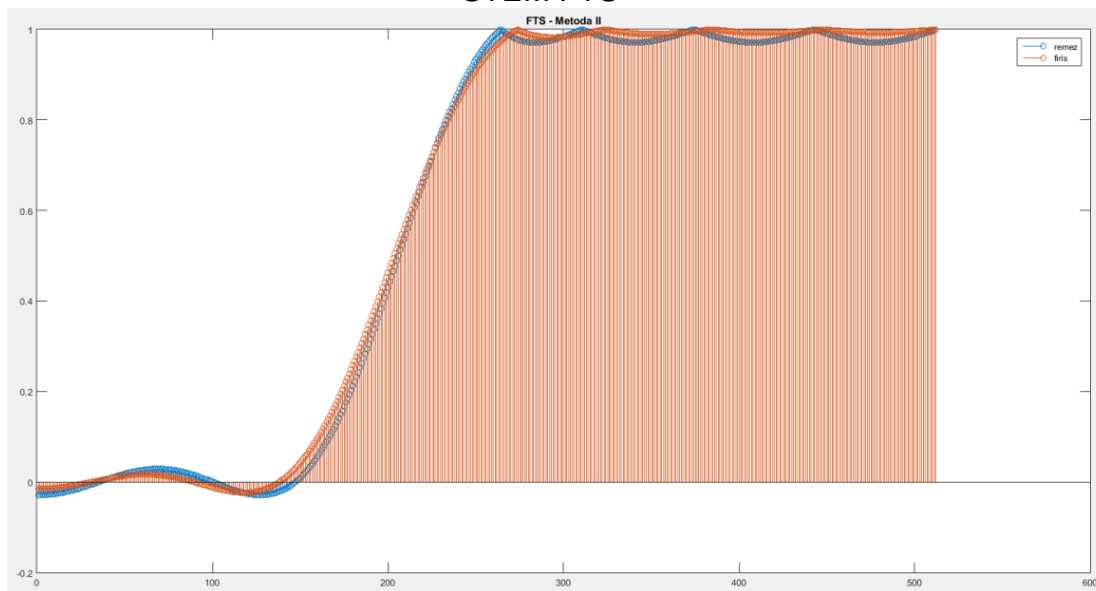
Metoda II – $FTS = 1 - FTJ$, $FTB = FTJ - FTJ$



STEM FTB

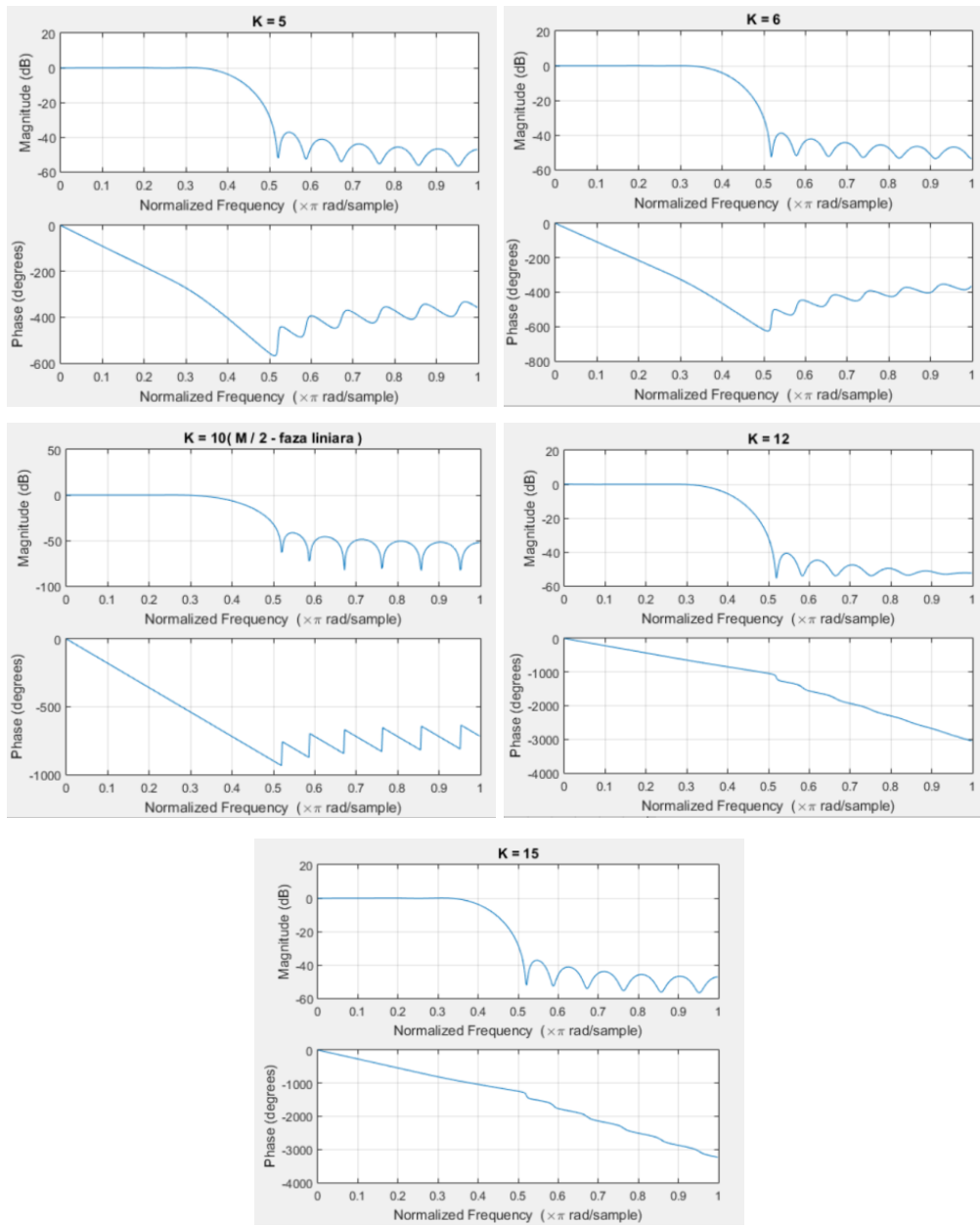


STEM FTS

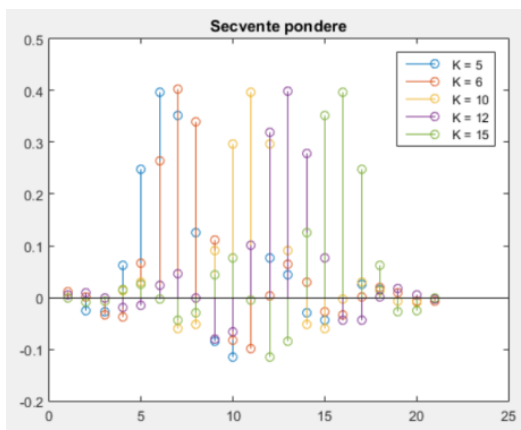


FAZA 2

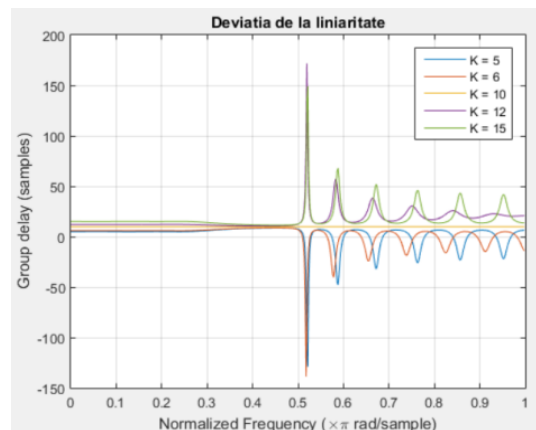
a) Am apelat firls_FTJ_c pentru mai multe valori ale lui K



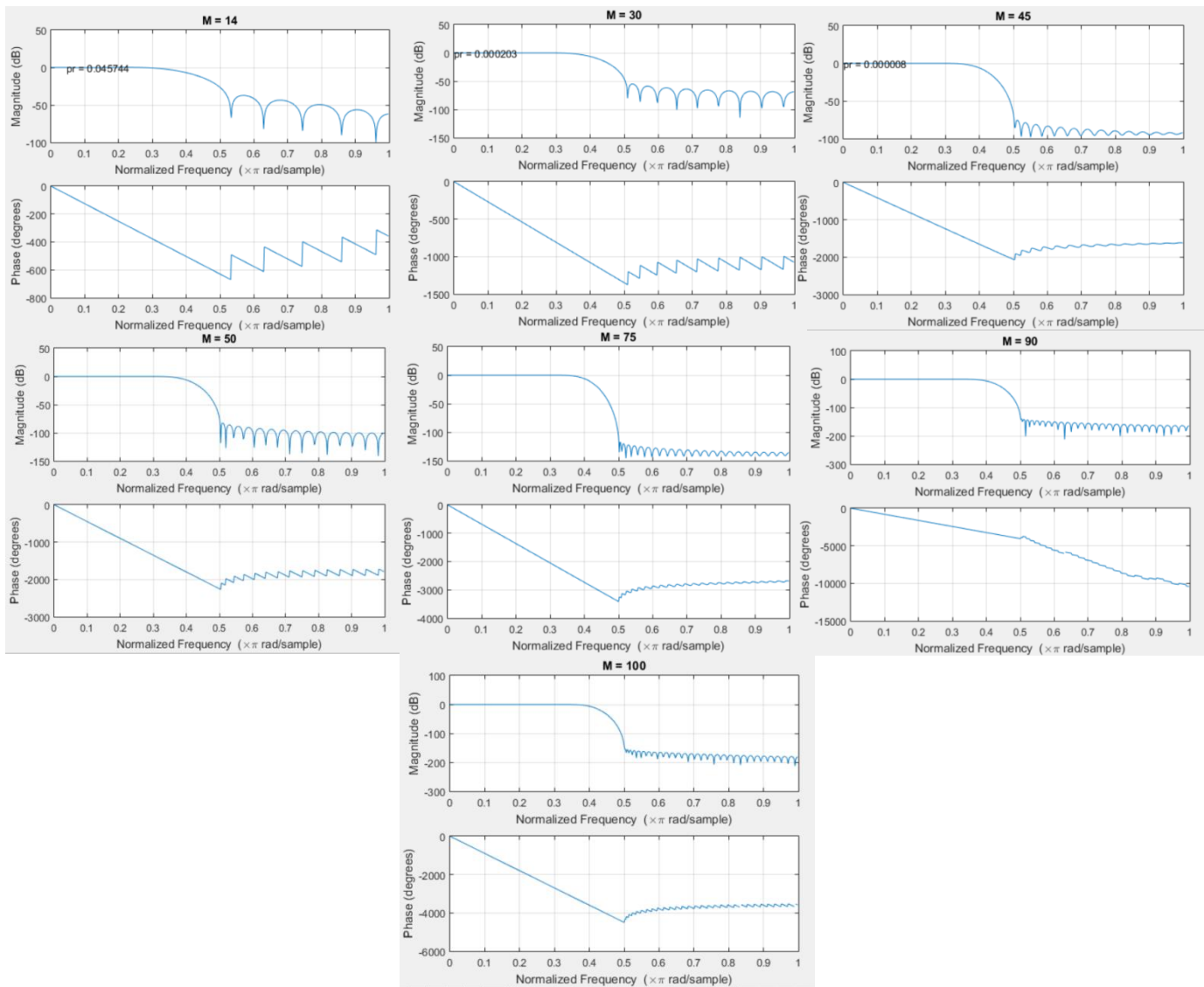
STEM



Deviatie de la liniaritate

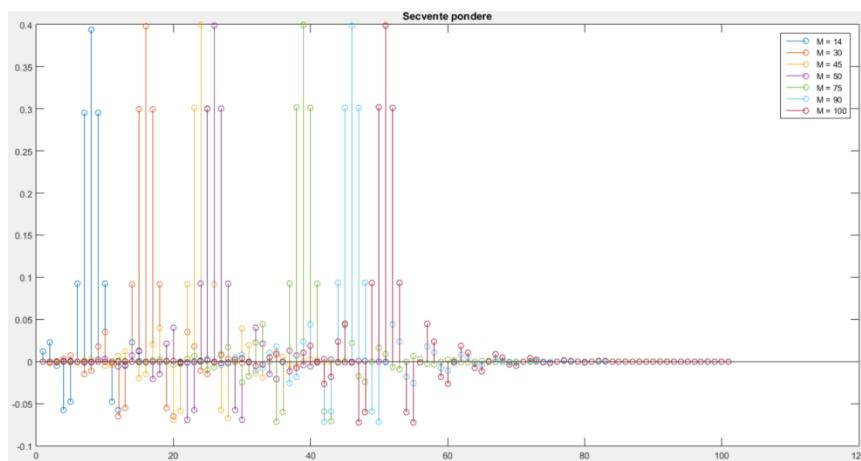


b) Am introdus parametrul pr in functia firls_FTJ_nou



Observam ca faza este liniara in toate graficele deoarece K a fost de fiecare data ales la jumatatea lui M .

STEM



pr1 = 0.0457
pr2 = 2.0312e-04
pr3 = 7.8241e-06
pr4 = 1.1455e-04
pr5 = 139.3821
pr6 = -3.2013e+06

Observam ca valorile performantei relative scad invers proportional cu valorile lui M.