14 Days Plan - "CMM Trip to Level 3: DSP Foundations & IQ Mastery"

- **Deep understanding of filters** (poles, zeros, stability, frequency response)
- **Hands-on IQ signal processing**
- **Contributing to projects like IQEngine**
- **Moving up the Capability Maturity Model to Level 3**

Here's how we can structure a **focused 14-day mini-plan** to get you there:

14-Day Plan: Hello World → DSP → Filters → IQEngine

Week 1: Foundations & Hands-on IQ

Day 1–2:

- Generate synthetic IQ snippets (like `hello.iq`)
- Create matching `.sigmf-meta`
- Visualize **I/Q waveforms**

Day 3–4:

- Compute **FFT, magnitude, power, phase**
- Understand **role of sample rate, center frequency, datatype**
- Plot spectrum and annotate peaks

Day 5–6:

- Apply **basic filters** (lowpass, highpass, bandpass)
- Observe changes in I/Q waveforms and spectrum
- Note effects of filter parameters

Day 7:

- Document observations: link **raw samples → FFT → filtered waveform → insights**
- This solidifies the **DIKW journey**

Week 2: Intermediate DSP & Filter Theory

Day 8–9:

- Introduce **filter theory**:
  - Poles & zeros
  - Stability criteria
  - Frequency response
- Visualize **filter magnitude & phase responses** in Python

Day 10–11:

- Apply **designed filters** on IQ data
- Compare **unfiltered vs filtered FFT, magnitude, power**
- Experiment with **different filter types**

Day 12–13:

- Explore **weighted averaging, smoothing, decimation** on IQ data
- Introduce **simple demodulation** or spectral extraction

Day 14:

- Integrate learning into a small **Hello World IQEngine experiment**
- Document and prepare for **next-level contributions**

Outcome after 2 weeks

- You'll **read, visualize, and filter IQ data confidently**
- You'll **understand filters deeply**, including poles, zeros, and stability
- You'll be able to **design experiments independently**, move toward Level 3 maturity
- You'll have a **foundation for contributing to IQEngine** or similar projects

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