

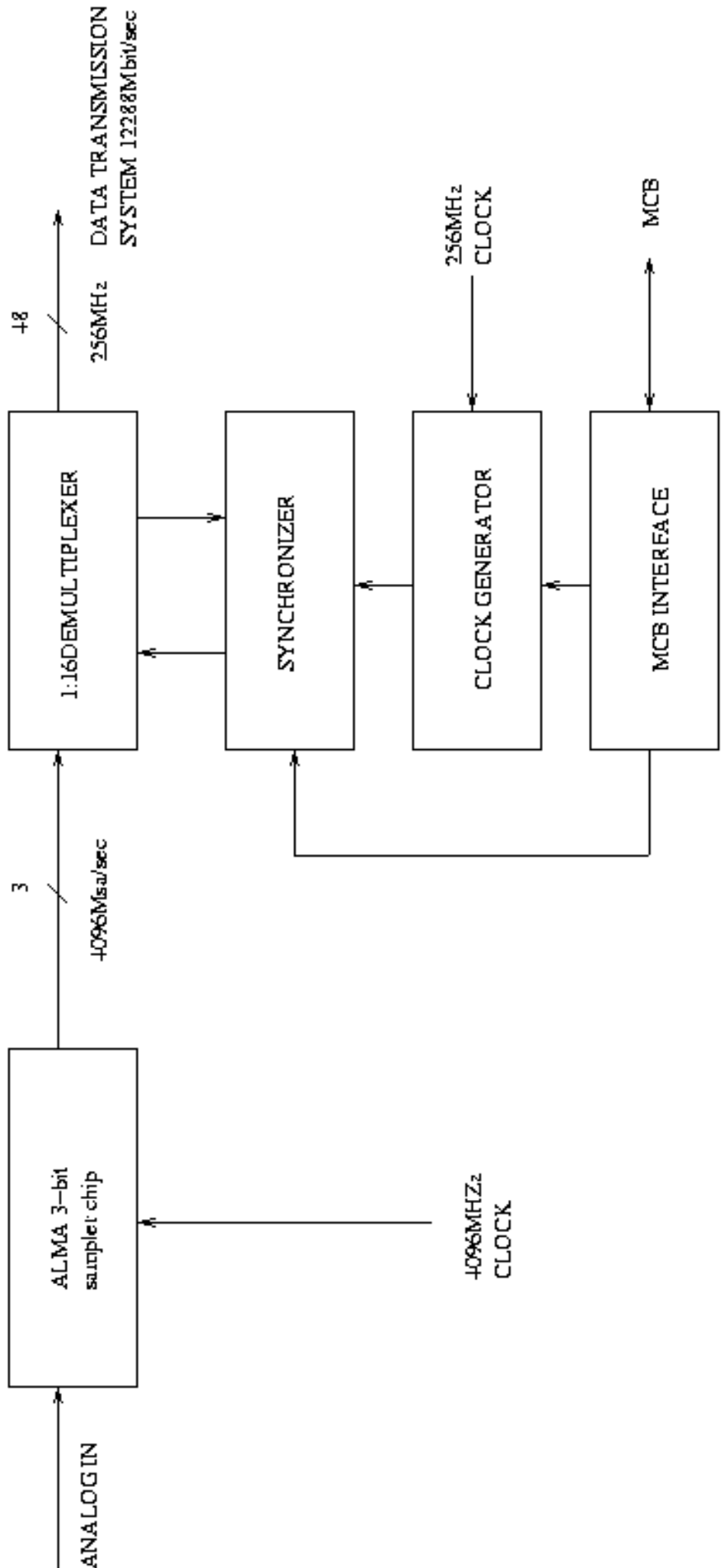
EVLA SAMPLERS

- High speed wide band 3–bit for most bands
- Lower speed narrower band 8–bit for bands with RFI.

HIGH SPEED SAMPLER

- 2GHz bandwidth 3-bit 4096 Msamples/sec.
- Specifications nearly identical to ALMA.
- Simpler clock requirements, EVLA doesn't require variable clock phase.
- Uses sampler chip being developed for ALMA.
- ALMA schedule compatible with EVLA.

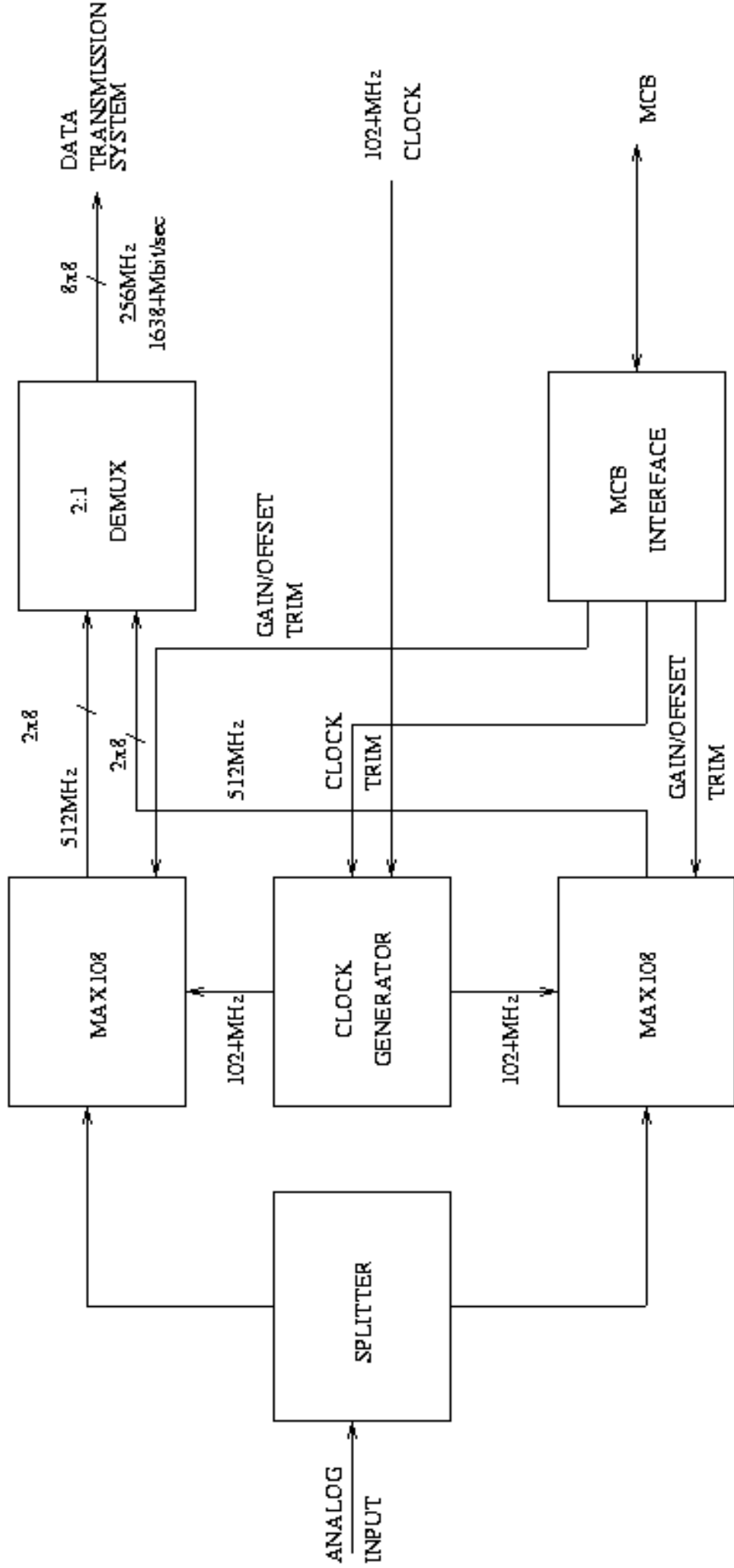
EVLA HIGH SPEED SAMPLER



HIGH RESOLUTION SAMPLER

- Low frequency band RFI environment requires high resolution sampler.
- 8-bit 2048 Msamples/sec 1GHz bandwidth.
- 8-bits parts are commercially available that operate at 1.5Gsamples/sec. that support 2:1 interleave.
- Implications for threshold level matching and sampling clock skew.

EVLA HIGH RESOLUTION SAMPLER



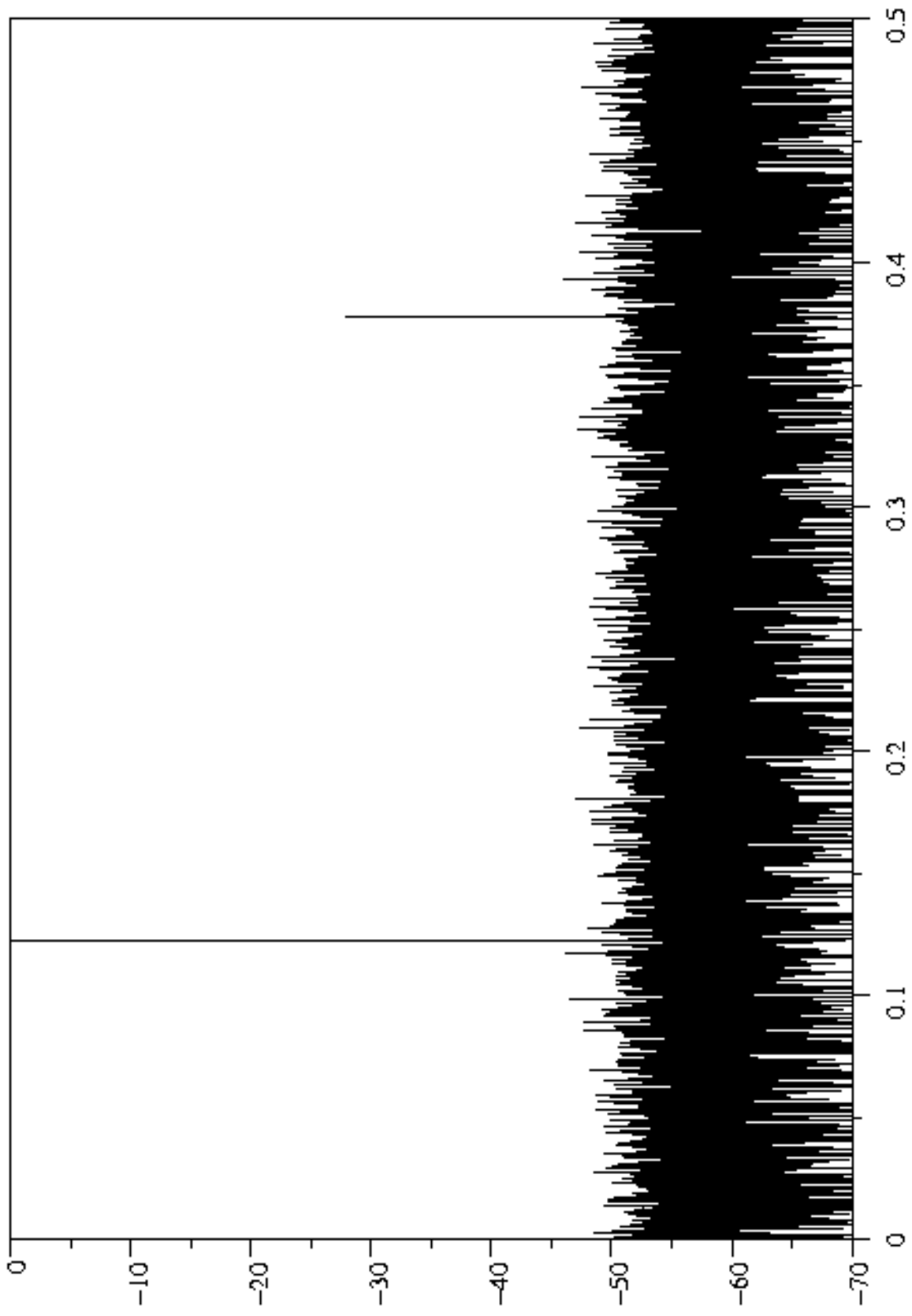
LEVEL MATCHING

- Parts guaranteed for $\frac{1}{2}$ LSB absolute errors.
- 2:1 interleave puts level matching artifacts at DC and Nyquist frequency.

SAMPLING CLOCK SKEW

- Clock phase between sampler chips must be closely controlled at 180 deg.
- Skew between samplers creates images symmetric around frequency 0.25.
- This is a feature that can be easily detected and used to automatically trim clock phase by module microcontroller.
- Could potentially use PCAL or other test signal.

Sinusoid sampled with 10% clock skew in gaussian noise



MAX 108 FAMILY

- MAX 108 1.5 Gsa/sec. MAX 104 1.0 Gsa/sec.
- Designed to support interleaved operation.
- 2.2GHz analog input bandwidth.
- >7.5 ENOB at -3dB FS published performance.
- Correlator processing in high resolution modes is to be 7 bits plus sign.
- Only 8 bit commercial parts available at this speed.

RFI-DEFENSE IN DEPTH

- Circuit Design
- Component Selection – connectors
- Board Design
- Packaging

CIRCUIT DESIGN

- Differential signaling techniques.
- Ground, shielding and power organization.
- Component selection.

BOARD LAYOUT

- Stripline transmission line techniques.
- Multilayer with ground and power planes on outer layers.
- Careful attention to isolation of separate ground and power planes.
- RFI is consistent with good high speed electrical performance.

PACKAGING

- 3 samplers and data transmitter in a single module.
- Careful shielding of analog input circuitry from digital sections.
- Careful power distribution within module.
- Minimize external penetrations.
- Extended height module with honeycomb filter.