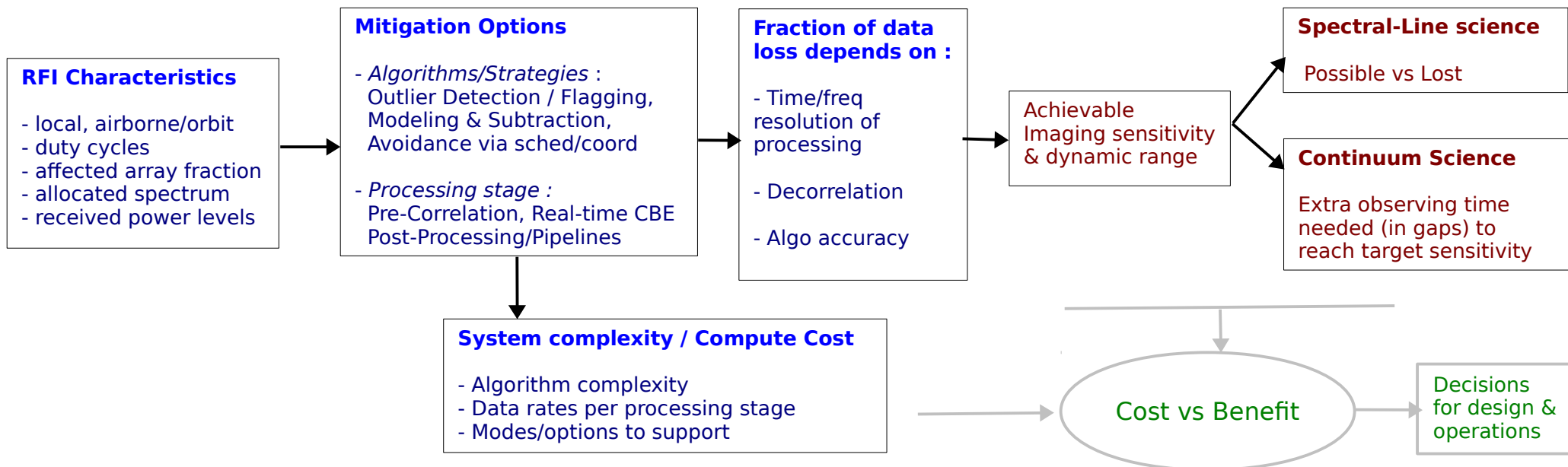
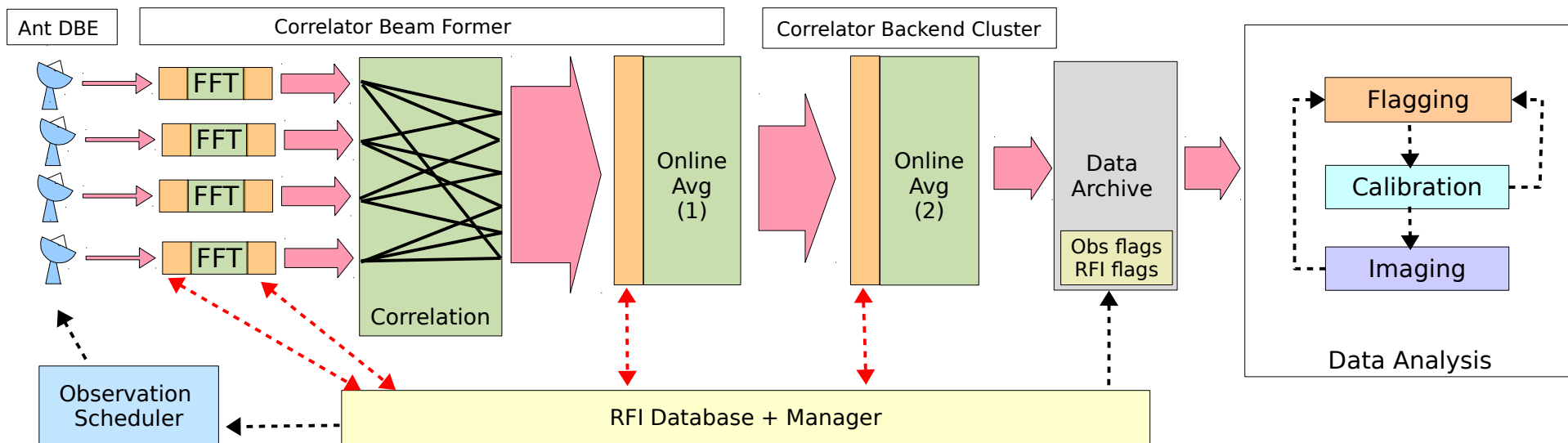


Effects of RFI on system design and science operations



- RFI monitoring results will feed into system design and operations plans.
- Current Operations : We do only post-processing outlier detection/flagging (i.e. the most lossy option.)
At L-Band, ~30% data loss. Higher bands are better.
We use some RFI-sweep information manually, during observation setup.
- Many additional users of the 1 - 100 GHz spectrum are expected in the next few years (VLA + ngVLA).
 - Do we need to do better ?
 - Can we ?

Ideas for the ngVLA : Integrated RFI management



■ : RFI mitigation algorithms applied at different stages of data acquisition and processing

Database : Store RFI characteristics and meta-data

- Satellite orbits and frequencies, locations / schedules of terrestrial emitters,
- Meta-data about RFI detected by the real-time system

Manager : Analyse RFI metadata and decide optimal actions for the current observation.

- Match the current RFI and observing goals to suitable mitigation algorithms and tunings
- Smart scheduling around predictable (or currently detected) emitters

But....

How much of this do we really need ?

It depends on RFI characteristics at each stage ■

Some questions to answer before ngVLA system design

ngVLA Memos 48/70/71 assume some RFI characteristics, and analyse the cost vs benefit of various mitigation options.

=> Need to test the assumptions before using such analyses for any design efforts.

- Example : Real-time flagging (CBF/CBC) can be effective if comm signals show enough usable 'gaps' in time and frequency
But, system design/operation gets complicated and expensive
 - Worth the effort ? Need to measure comm signals at high time/freq resolution
- Example : If LEO sats completely fill allocated bands, there will be a significant loss of science capability.
Algorithms to mitigate such RFI are expensive and experimental
 - Do we need to invest immediately in R&D for modeling/subtraction in the RTS ?
 - Tests/monitoring under way with SpaceX to directly measure the RFI and its effects on science images.
- Example : Smart scheduling using RFI database information or satellite orbits : How much is possible ?
 - Experiments with SpaceX for coordinated spectrum sharing (via NRDZ...)
 - Technical prototypes of making/using an RFI database to influence scheduling or post-processing algorithms.

=> General RFI monitoring and database generation/sharing may be useful for all of the above.