Signal Chain: RFI use cases

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June 13, 2017

SKA SQUARE KILOMETRE ARRAY

CSP

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Role of RFI Use Cases

- Goal:
  - If the telescope successfully handles the use cases, SKAO can be confident SKA1 can carry out all the high-priority science cases in the expected RFI environment, over the lifetime of the instrument.

➔Exhaustive: should cover expected RFI environment

➔Rigorously testable: simple & well-defined, so engineers can design to and sell off against these use cases

➔Few in number: to allow careful consideration & testing

Definition of RFI use cases

- Input signals: complete definition of incoming signal, including all information needed by DSH, CSP, SDP
  - Strength vs. local Tsys
  - Frequency & time dependence
- Response: complete definition of response to incoming signal
  - Flagging (strong RFI)
    - Levels
    - Allowable false positives
    - Extension in frequency & time (req'd and allowed)
  - Relaxation of requirements around RFI (weak RFI & aliasing)
    - Acceptable SNR loss (as function of freq & time)
  - Should include allocation of budget across elements – e.g., DSH interleaving artefacts shall be at some level below

Possible RFI Use Cases

- GSM through main lobe
- GSM through dish sidelobes
- GNSS
- DME
- “Background” (current & long-term)

RFI Use Cases: questions

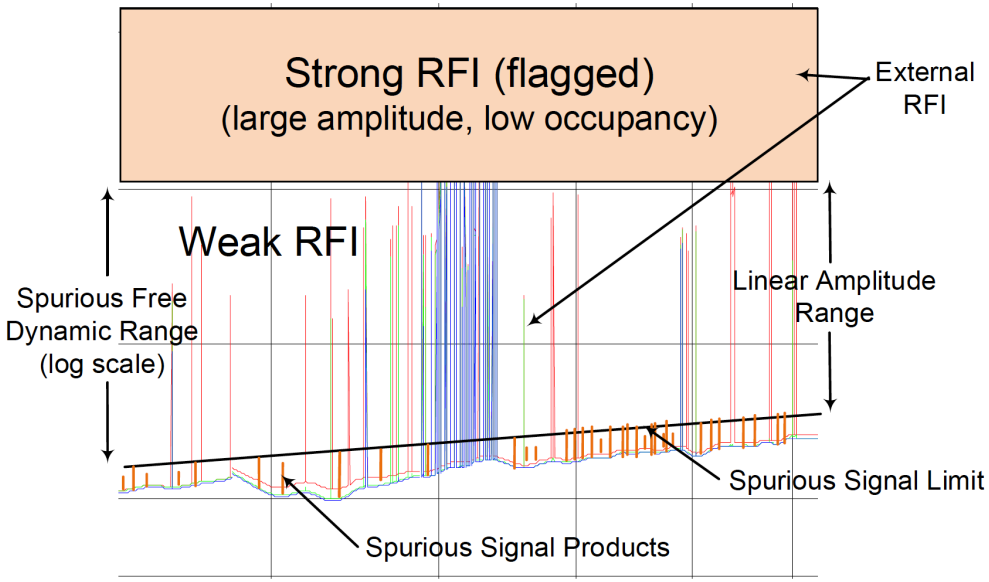
- RFI Use Cases as basis of requirements verification
- Definition, result parameterization
  - What about beam-forming?

Backup slides: RFI categories

RFI Categories

Severity	Description	Effect on reqts.
None	No RFI present in the band	Telescope should fully meet all L1 reqts
Weak	RFI present but aliased features not detectable (remains in linear regime)	Noise levels in channels directly affected by RFI may be degraded Other channels are not affected (DSH +) CSP issue
Strong	RFI strong enough that aliased features are an issue	Substantial areas of the band may be degraded or useless for astronomy Signals with substantial RFI s/b flagged as far upstream as possible Primarily a CSP issue; some implications for DSH, TM, SDP
Disruptive	RFI so strong that observations are significantly degraded.	Observations not possible – this is a "survivability" specification Primarily a DSH/TM issue

Dewdney Signal Chain Document (2015)



- Spurious-free dynamic range: allowed level of spurious signals from “weak” RFI
  → Not detectable in 2000s (R2) or 1000 hrs
- Weak/strong RFI transition??
  → Set by lost observing time?

Questions and Discussion?

Thank you.

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