MDU cable network channel S parameter measurements

- Tested in Wuxi city, Jiangsu province

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Contents

- Test items
- Test program
- Test topology and environment
- Test results

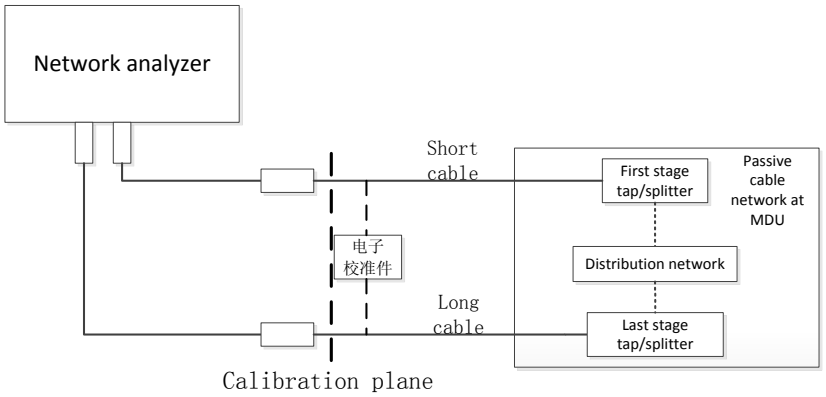
Test items

- Scenario: Node+0 passive cable network at MDU
- Test items: channel S parameters
- Test equipment: Network analyzer (Agilent E5070B)
- Selected 3 sites in Wuxi, and tested on 2012.10.18-10.19
  - Test site 1 --畅舜苑小区
  - Test site 2 --广丰二村
  - Test site 3 -- 金河湾家园
- Considerations on test sites selection:
  - mainly according to upstream CNR measured on the CMTS side. Dividing the network transmission performance into excellent/good/bad 3 classes.
  - Tall building (32 floors) and multi-floor building (5-6 floors)
  - Mainly test passive tree topology network (with cascaded tap/splitter)

Test program

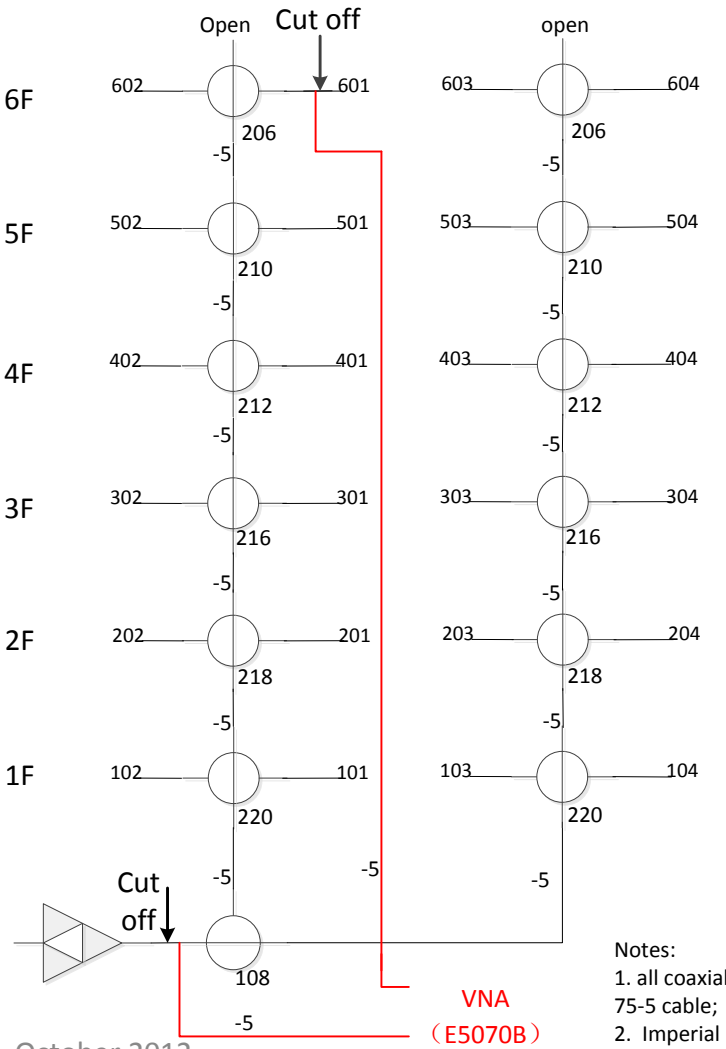
- Full spectrum bandwidth test & multi- trunk test (divide whole spectrum into several segments)
  - Full spectrum test:
    - 1MHz~2GHz; 1601 sampling points
  - multi- trunk test：
    - 1MHz ~1.5GHz
    - 64MHz segment, 1601 points/per 64MHz
- Network analyzer calibration

Note: Test results described herein can only be used for the analysis of coaxial network characteristics trends, does not apply to the channel modeling system design



Topology - test site1 (building 11#)

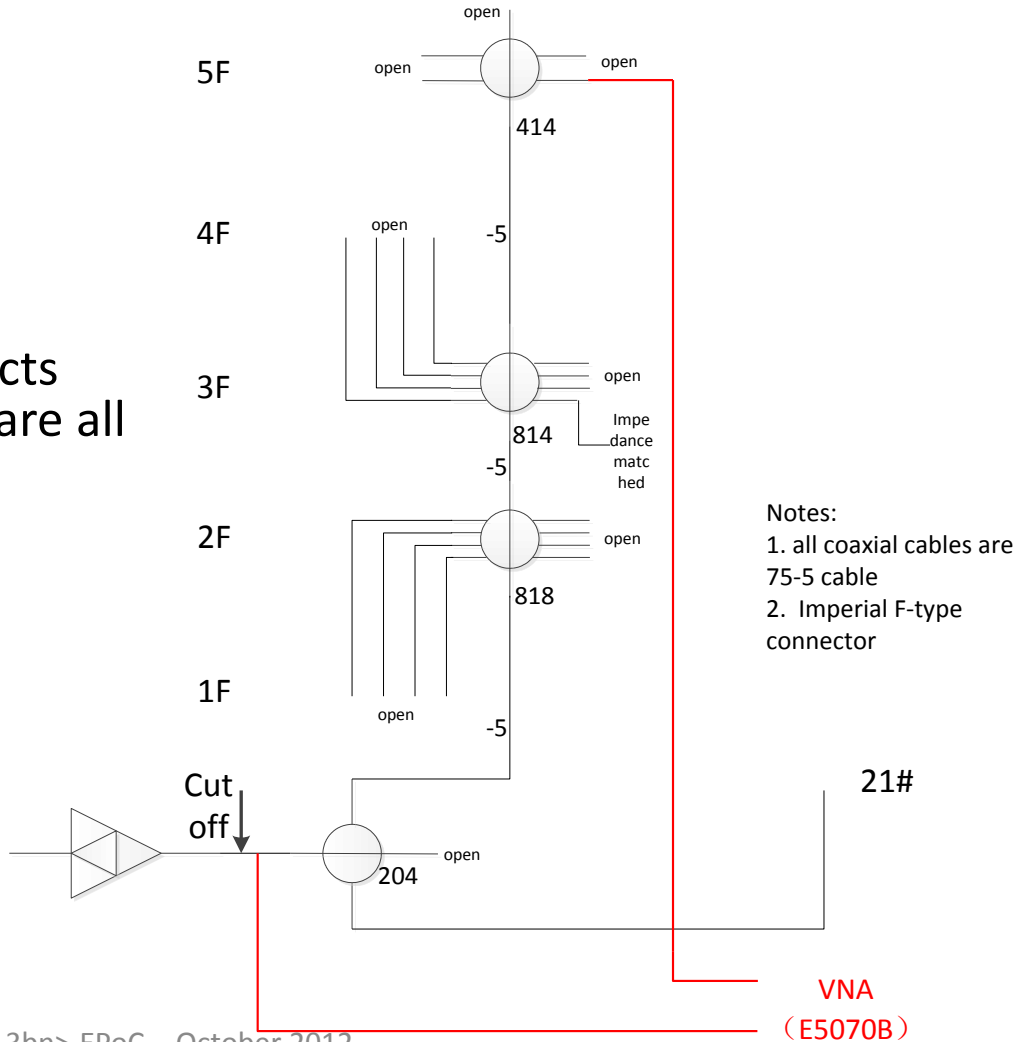
- Building infos：
  - 11# is a 6-floors building, 4households per floor
  - N31° 33'40",E120° 17'30 “
  - Altitude of 11m
- Test time/environment
  - 2012.10.18 morning
    - Start time - 10:35
    - End time - 12:50
  - environment
    - Temperature: 15° C
    - Humidity : 42%



Notes:
1. all coaxial cable are 75-5 cable;
2. Imperial F -type connectors

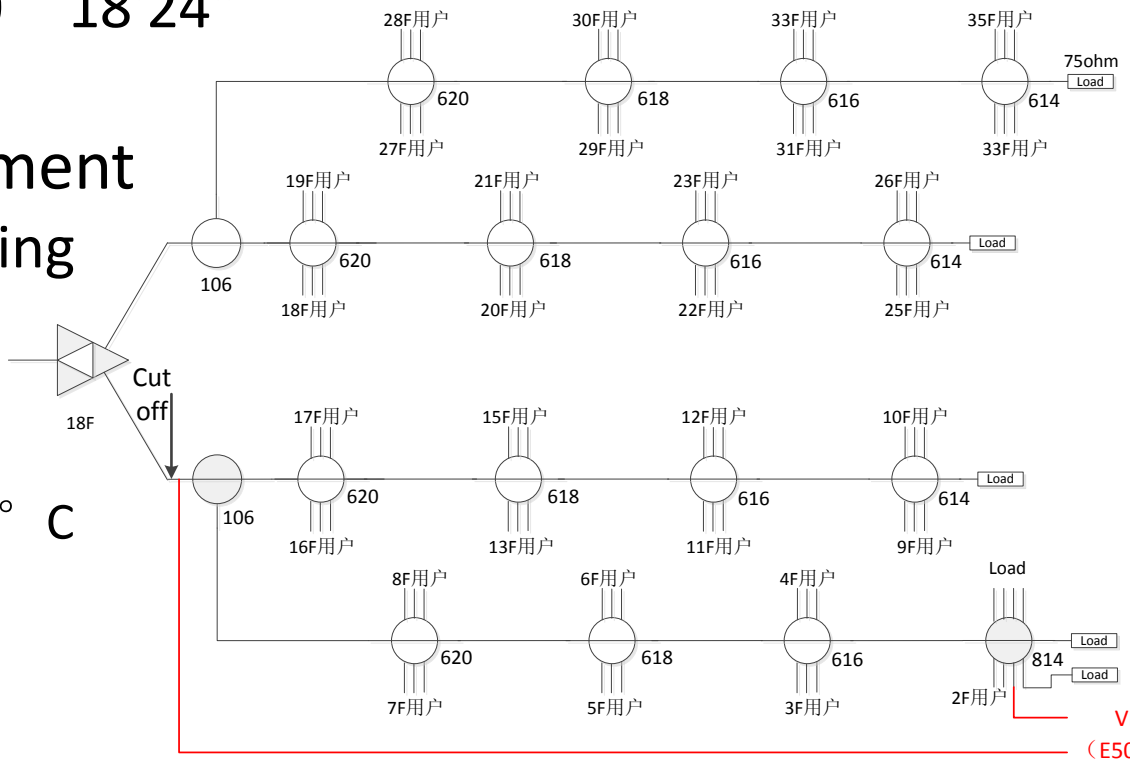
Topology - test site2 (building 22#)

- Building infos：
  - 22# is a 5-floor building , 4 households per floor
  - N31° 35'56",E120° 19'3"
  - Altitude: 9m
  - Only one subscriber connects with network, other ports are all open.
- Test time/environment
  - 2012.10.18 afternoon
    - Start time: 14:20
    - End time: 16:33
  - environment
    - Temperature: 16° C
    - Humidity : 28%



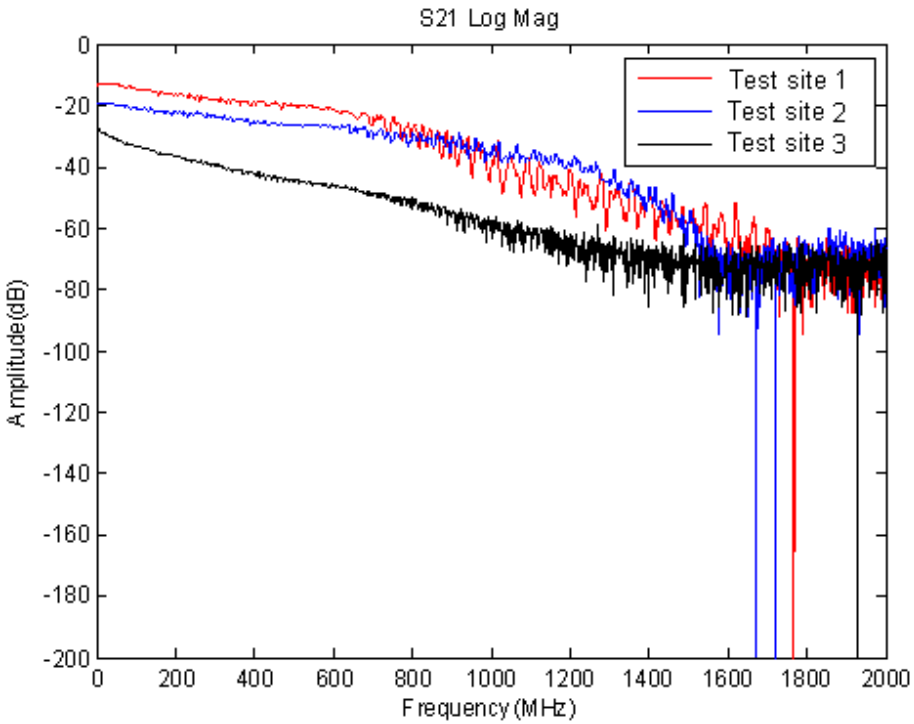
Topology - test site2 (building 31#)

- Building infos：
  - 31# is 32-floor building，3households per floor
  - N31°36'4",E120°18'24"
  - Altitude 5m
- Test time/environment
  - 2012.10.19 morning
    - Start time: 10:25
    - End time: 12:00
  - environment
    - Temperature: 14°C
    - Humidity : 52%

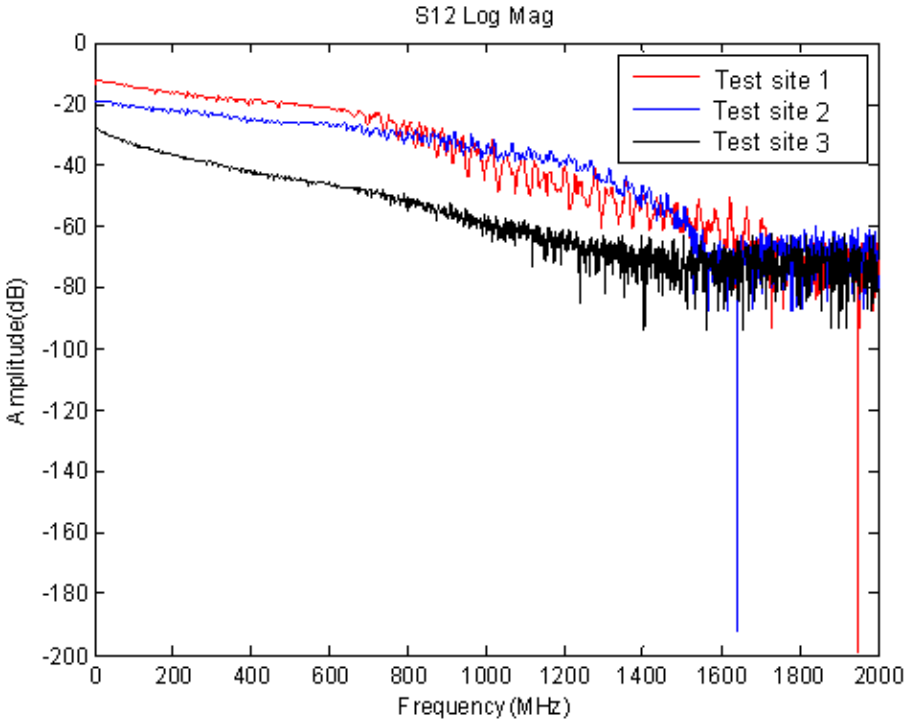


Notes:
1. all coaxial cables are 75-5 cable
2. imperial F-type connectors

Test results - S21 & S12



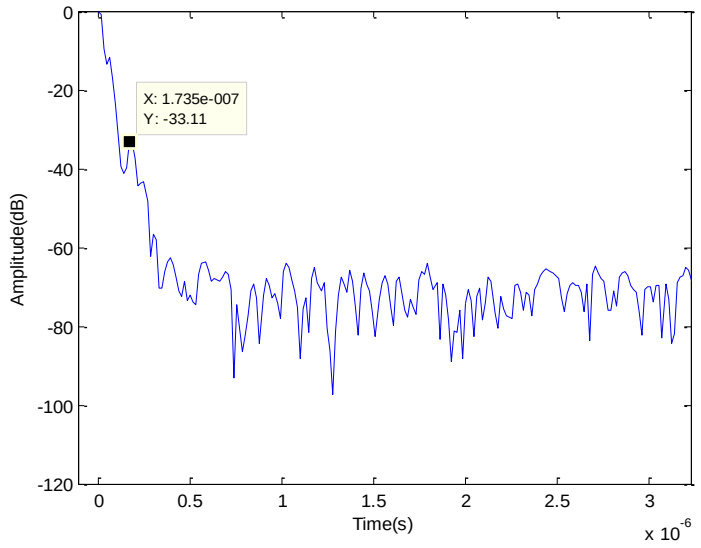
S21



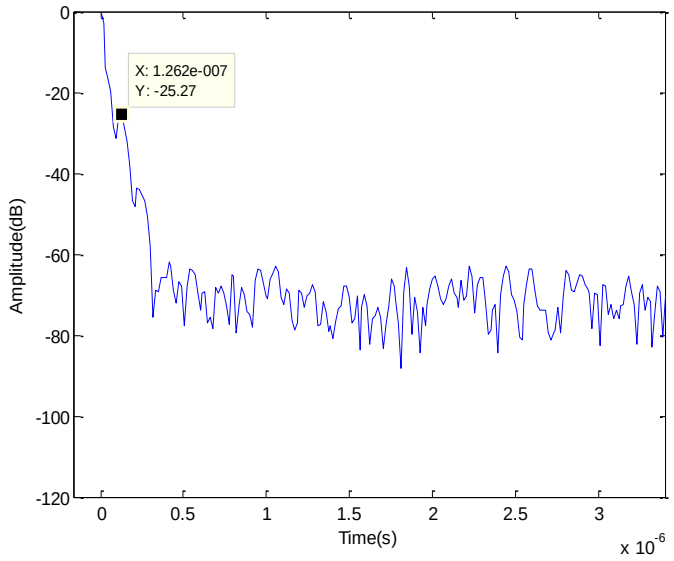
S12

Test results – micro-reflection1

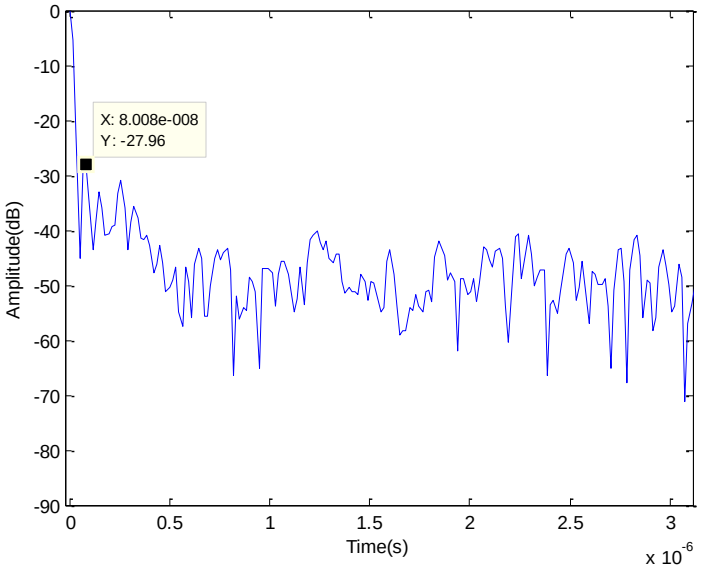
Test site 1



Test site 2



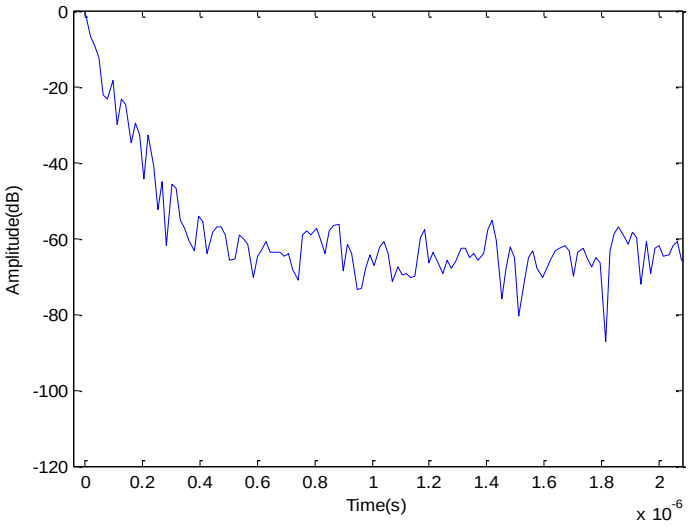
Test site 3



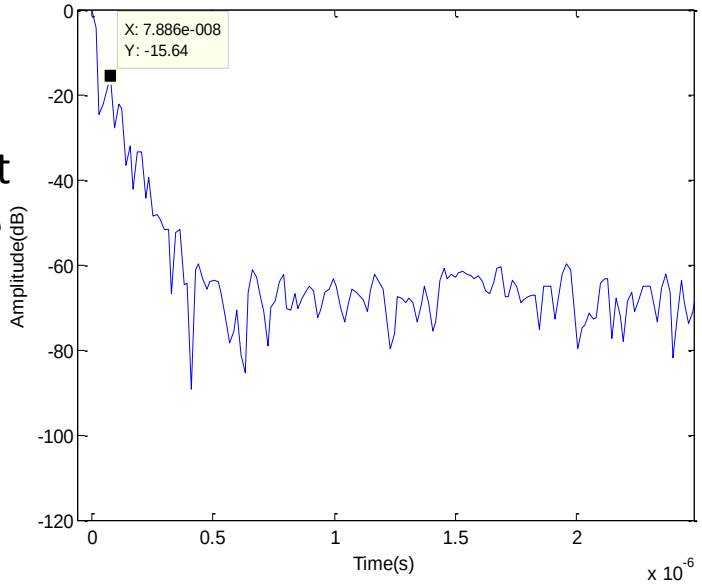
- 769~833MHz；
- 1601 points
- Blackman windows +IFFT

Test results – micro-reflection2

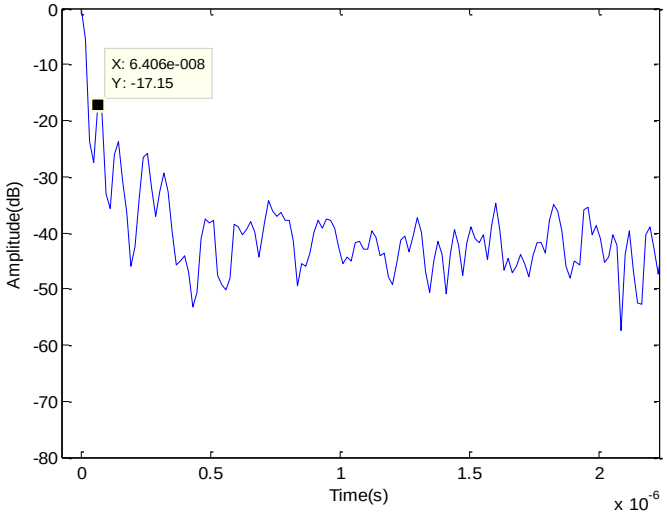
Test site 1



Test site 2



Test site 3



- 961~1025MHz；
- 1601 points
- Blackman window +IFFT

Some conclusions

- Bi-directional characteristics of passive coax networks are basically the same (S21=S12)

- Channel transmission loss is gradually stepping down under 1.5GHz, and decreased rapidly at 1.5G ~ 1.8GHz according to the test results at test site 2.
- The channel response is quite flatten below 1GHz spectrum. But above 1GHz, the channel response has significant fluctuations.
- Parts of network exist strong micro-reflections
- According to test results , some views on passive coaxial cable network channel characteristics
  - Multi path (micro reflection) do exist in passive cable network
    - Poor connections between cable/splitter/tap can cause serious reflections.
    - Splitter/tap port impedance unmatch/poor connections will cause frequency selective fading.
- Poor network consistency: channel performances differ significantly on different spectrum
- Cable channel changes slowly over time.