The feasibility study on higher frequency band for EPoC FDD downstream

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Background and objective

✓ In the last Geneva meeting, the following motion was passed.

> For an FDD system, the EPoC standard shall support operation over the following frequency ranges:
>
> > Downstream: 54 MHz to at least 1212 MHz
> > Upstream: 10 MHz to at least 234 MHz
>
> Actual frequencies in use on the coax will depend on the diplexer, region, etc. <u>Downstream operation above 1212 MHz to 2610 MHz is for further study.</u>

✓ The objective of this presentation is to show the results of CNR estimation in a 2.6 GHz band by using the parameters of commercially available products.

✓ Please note that
  - We understand the primary FDD DS frequency band should be up to 1.2 GHz from economical perspectives,
  - We only need an option of up to 2.6 GHz FDD DS band in case there is no available band for EPoC in less than 1.2 GHz.

Summary of this presentation

✓ In order to study the feasibility of a higher frequency band for EPoC, the expected CNR was calculated by using the parameters of commercially available products in a typical MDU network model in Japan.
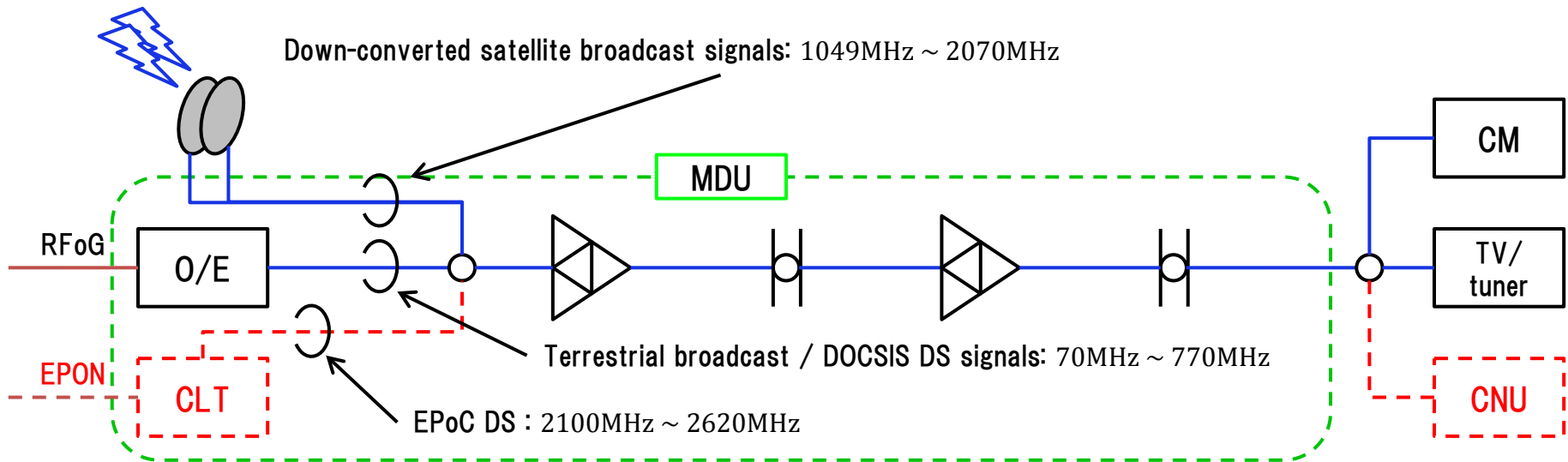
✓ As the result, it was found that a higher frequency band up to 2.6GHz is applicable to EPoC. The estimated CNR was 38 dB, while the required one is 35 dB.

✓ The followings are planed for further study :

    (1) measure the frequency response of the model in our lab,

    (2) evaluate the feasibility by filling up channel model table,

    (3) reconsider the DS operation above 1.2 GHz to 2.6 GHz in the standard.

Typical use case of higher frequency band

✓ EPoC is considered to be mainly used in MDUs as FTTB + EPoC systems.

✓ A typical MDU network model in Japan is illustrated in adhoc_eval_uematsu_01_0513.pdf.

✓ A 2.1GHz ˜ 2.6GHz frequency band in coax-based networks is reserved for the future extension of satellite broadcasting. No specific usage plan of this band has been announced.

Network model (N+2)

Down-converted satellite broadcast signals: 1049MHz ˜ 2070MHz

MDU

CM

RFoG

O/E

TV/
tuner

Terrestrial broadcast / DOCSIS DS signals: 70MHz ˜ 770MHz

EPON

CLT

EPoC DS : 2100MHz ˜ 2620MHz

CNU

Expected CNR at higher frequency band

The estimated CNR at a 2.6 GHz frequency band is shown in the following table, which are derived from the specifications of commercially available products.

Bandwidth (MHz)	CNR(*) @ 2.6 GHz (dB)
28.9 (CS digital broadcasting)	45.8
6	53.0
12	50.0
96	41.0
192	38.0

(*) CNR is calculated based on thermal noise. (Not including the distortion due to reflection, interference, etc.)

As required CNR for 4096 QAM is about 35 dB from dai_01a_1012.pdf, a 2.6 GHz band is considered to be applicable for EPoC.

Input power: 73dBμV

MDU

RFoG

O/E

CM

TV/ tuner

Loss : -45dB

Loss : -48.5dB

G: 38.5dB
NF: 10dB

G: 40dB
NF: 10dB

EPON

CLT

CNU