



MIC Japan

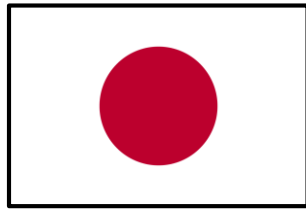


Pilot Project for Next Generation Digital Terrestrial TV Broadcasting in Brazil

11/30/2020-12/3/2020

Ministry of Internal Affairs and Communications, Japan

Pilot Project for Next generation Digital Terrestrial TV Broadcasting (DTTB) in Brazil



Period : Up to Mar. 2021

Place : Rio de Janeiro, Brazil

Objectives :

- Introducing a test environment for advanced DTTB technologies developed in Japan.
- An advanced DTTB platform for trial tests will be established in Rio de Janeiro in Brazil.

2. Project Schedule

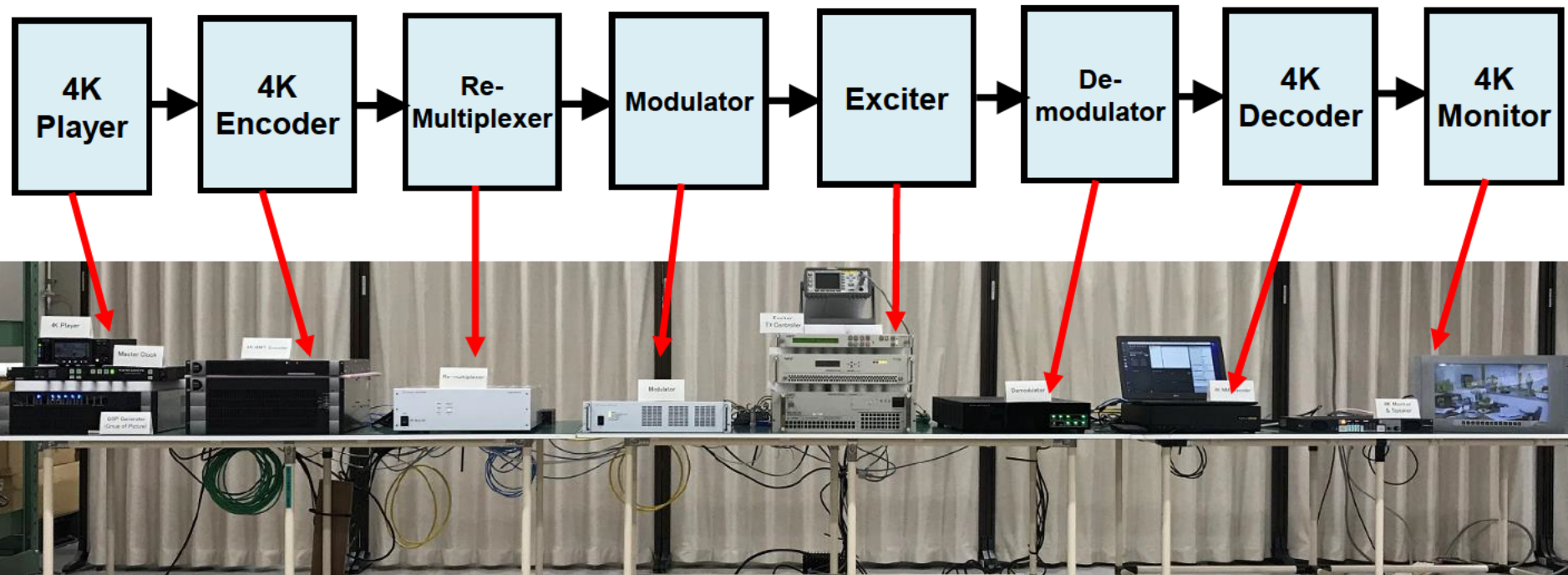
2

- ✓ NEC is supporting the establishment of an advanced DTTB transmission environment and its testing in Rio de Janeiro.
- ✓ Transmission tests with trial equipment will be started at the beginning of next year.

		2020				2021		
Description	Month	Sep	Oct	Nov	Dec	Jan	Feb	Mar
1. Preparation of trial equipment in Japan								
2. Testing at factory in Japan								
3. Delivery & custom clearance of trial equipment								
4. Installation of test environment in Brazil								
5. Introduction of Project at SET eXPerience								
6. Operation and testing by the SBTVDF.								
7. Joint evaluation with NEC (Expected to be done remotely)								
8. Wrap-up Meeting								

3.0 Conditions for Factory Tests in Japan

- ✓ NEC has prepared the following equipment and tested 4K program transmission with them.
- ✓ NEC confirmed 4K program reception with a set of transmission parameters for the advanced DTTB system.



3.1 Equipment Specifications

4K Players and 4K Monitors

- 4K Player : 3G-SDI x 4 output
- GPS Receiver : 10MHz, Black Burst and NTP Output
- GOP Generator : Group of Picture reference output
- 4K Monitor : 12G input
- Audio Monitor : 12G input and 32ch audio indication

4K Player



GPS Receiver

GOP Generator

4K Monitor



Audio Monitor

3.1 Equipment Specifications

4K Encoder

- 4K and 2K H.265 MMT Encoder module
- Video I/O : 4K (2,160p) and 2K (1,080p/i)
- Audio I/O : Embedded Audio, 32ch
- Video Encoding : H.265|HEVC Main10 Profile
- Audio Encoding : MPEG-4 AAC (ISO/IEC 14496-3)
- 4K I/O : 3G-SDI x 4 and 12G-SDI

4K Decoder

- 4K H.265 TLV/MMT Decoder
- IP Input : MMT/IP Input
- 4K Output : 3G-SDI x 4 or 12G-SDI signal



Encoder



Mounting Shelf



4K MMT Decoder

3.2 Equipment Specifications

Re-Multiplexer

- IP Input : MMT/TLV input of layer-A, B, C and LLch-1 system
- IP Output : Two XMI packets to the Modulator
- Multiplexing: FCE Block process, Frame process and XMI packet

Modulator

- IP Input : XMI/IP input
- IF Output : H1, H2, V1 and V2
- Output frequency : 37.15MHz and 10dBm \pm 1dB/50ohm
- Modulation : Bit-Interleaved Coded Mod and Hierarchical Synthesis
- Interleave : Time and Frequency Interleave



Re-multiplexer

Modulator

3.3 Equipment Specifications

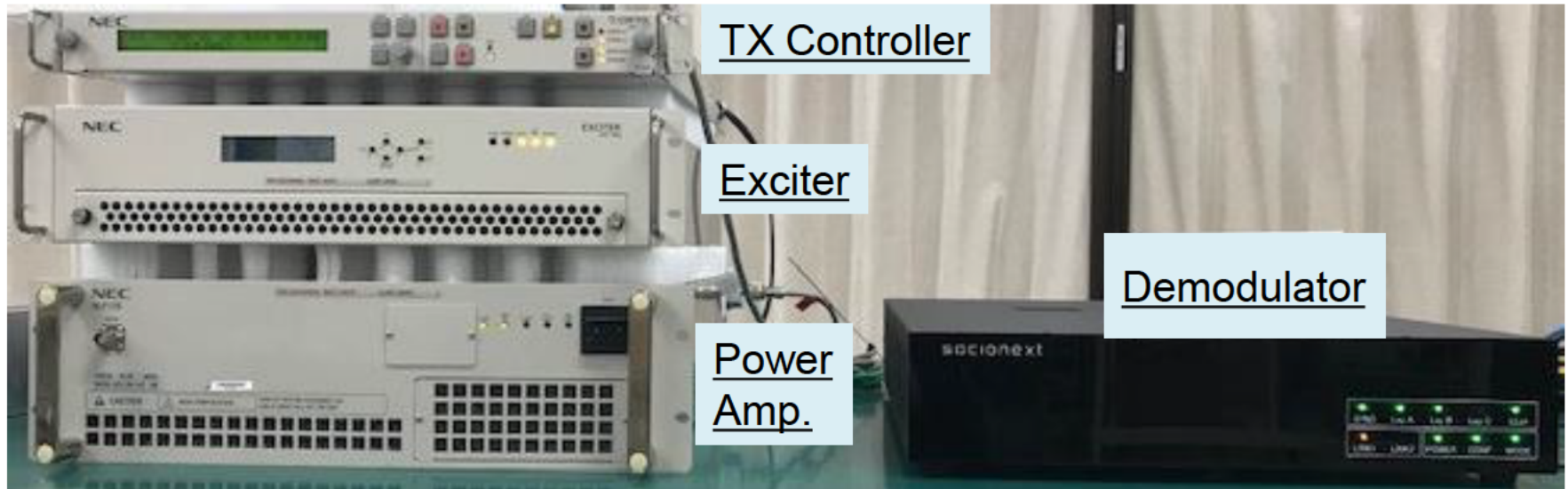
7

Exciter and TX Controller

- IF Input : OFDM modulation signal (37.15MHz)
- RF Output : OFDM modulation wave
- Bandwidth : 5.57MHz and 35 segments (H polarization)

Demodulator

- IF Input : H1, H2, V1 and V2
- IP Output : MMT/IP
- Output frequency : 37.15MHz and $10\text{dBm} \pm 1\text{dB}/50\text{ohm}$
- Modulation : Bit-Interleaved Coded Mod and Hierarchical Synthesis
- Interleave : Time and Frequency Interleave

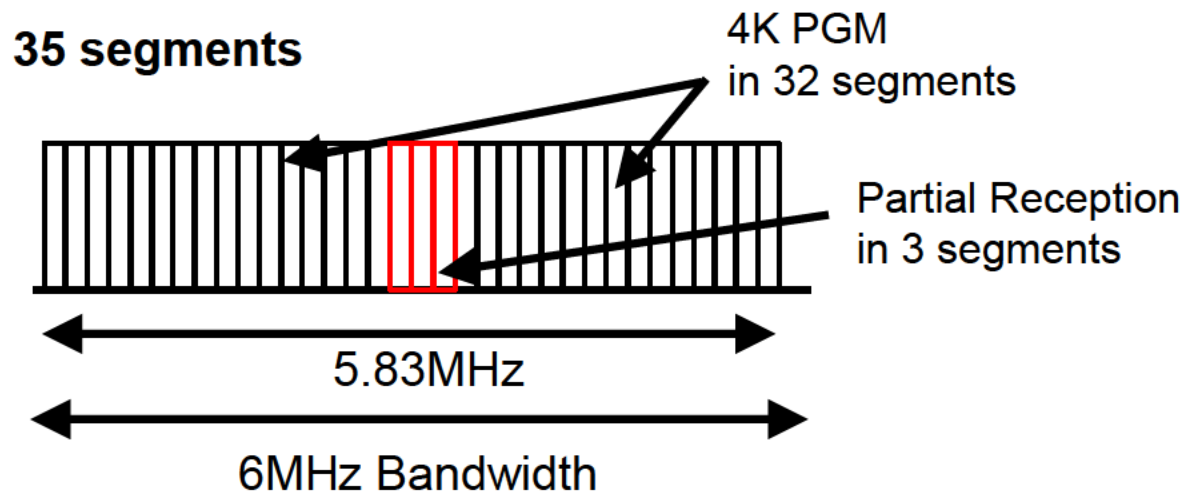


4.1 Laboratory Test Transmission Parameters

Laboratory Test Transmission Parameters

The following equipment transmission parameters are set and 4K program reception has been confirmed.

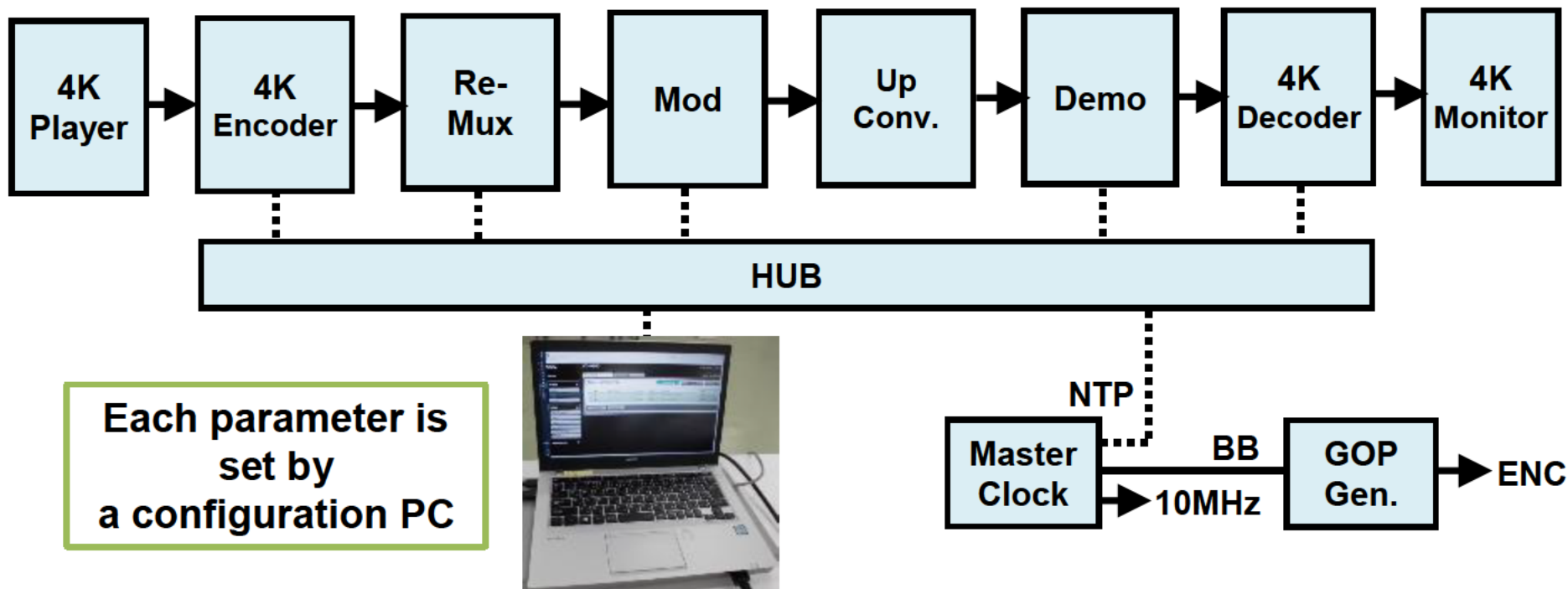
- Modulation : Non-Uniform Constellation (NUC), 256QAM
- Error correction : LDPC (12/16) + BCH
- FFT : 16k
- GI ratio : $800/16384 \doteq 1/21$ (126 μ s)
- Band width : 5.83MHz at Exciter output
- Variable pilot insertion ratio
- System : SISO



4.2 Factory Test Transmission Parameters

NEC conducted a different factory test with the following parameters.

- Video coding : 2K/4K, 20Mbps to 30Mbps
- Modulation : QPSK, 16QAM, 64QAM, 256QAM, 1024QAM
4096QAM
- Error correction : LDPC(2/16 to 14/16) + BCH
- FFT : 8K, 16K, 32K
- GI ratio : 126.56us to 648us



4.3 Factory Test Transmission Parameters

10

NEC will prepare the following measurement instruments for the pilot project in Brazil.

(1) Advanced signal analyzer

- Constellation, Frequency Response, Delay Profile, and TMCC
- Input Level, and MER

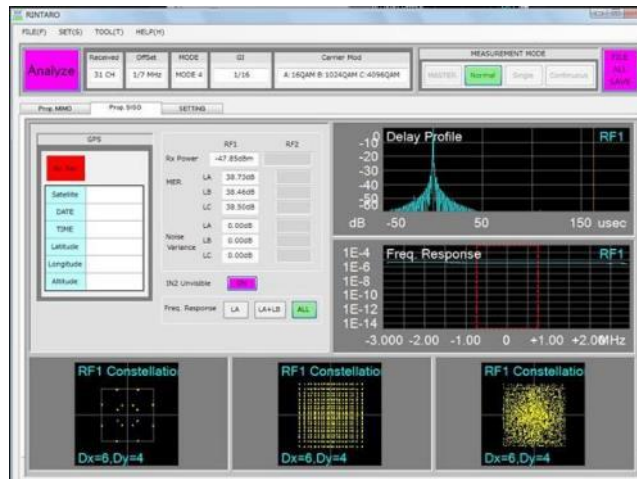
(2) TLV Packet Analyzer

- BER(PN)
- PER(TLV packet)

(3) Spectrum Analyzer

- Wideband spectrum measurement such as adjacent channels

Advanced
Signal
Analyzer

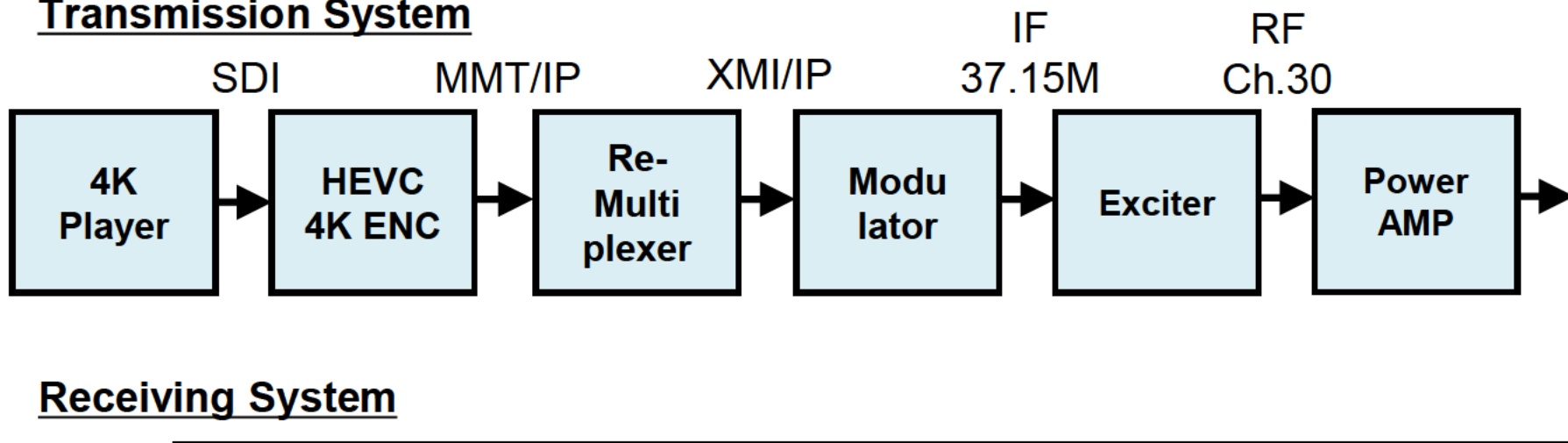


TLV Packet Analyzer

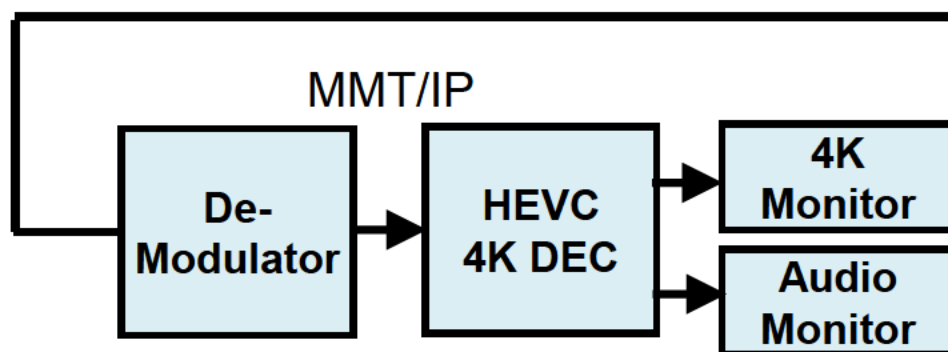
5.1 Factory Test Block Diagram

11

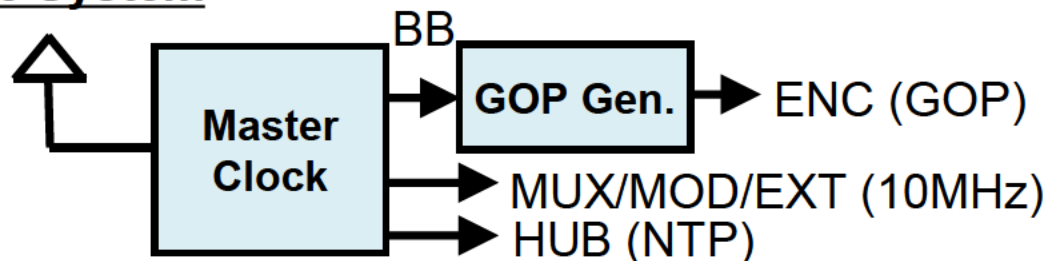
Transmission System



Receiving System



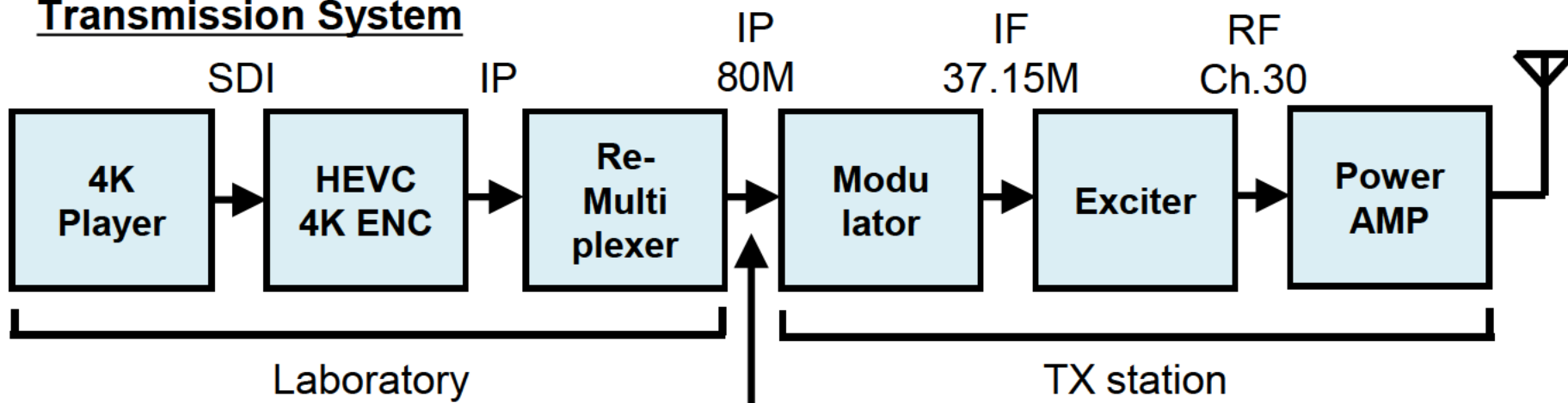
Sync System



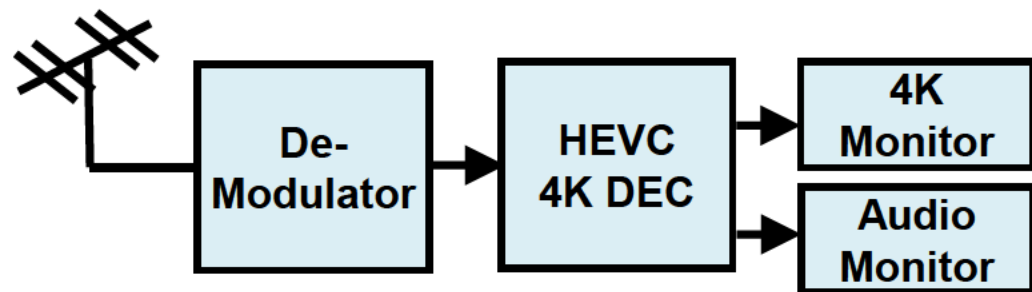
5.2 Brazil Pilot Project Block Diagram

12

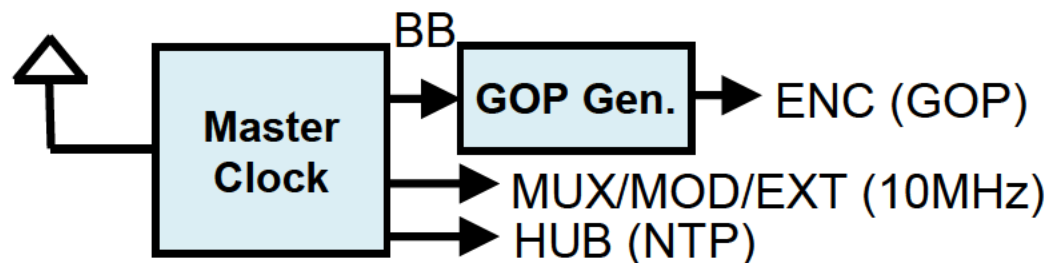
Transmission System



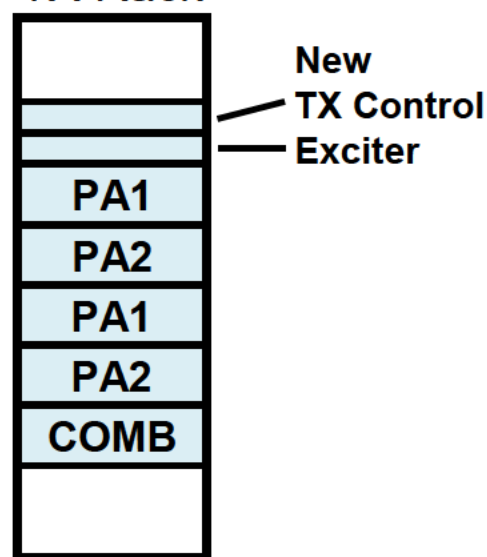
Receiving System



Sync System



TX Rack



6.1 Transmission Test Plan in Rio de Janeiro

13

- ✓ Encoder and Re-multiplexer will be installed at a studio.
- ✓ Transmission line between the studio and the TX station will use an existing IP route.
- ✓ Modulator and exciter will be installed in the existing TX rack in TX Station.



Map of Transmission Route in Rio de Janeiro

Advanced DTTB System Measurements

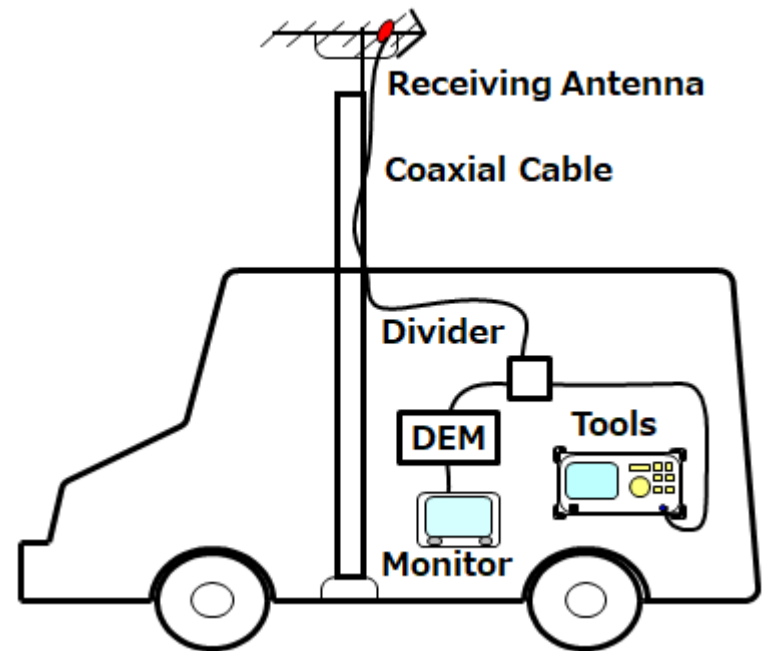
- ✓ Field Transmission Tests will be carried out in Rio de Janeiro.
- ✓ The following items are expected to be measured with a field analyzer.
- ✓ Reception characteristics will be compared with ISDB-Tb.

Signal Transmission Characteristics

- Signal Reception Level
- MER (Modulation Error Ratio)
- BER (Bits Error Rate)
- Channel Spectrum
- Constellation
- Delay Profile

Video and Audio Quality Check

- Bit Rate of Video Coding
- Bit Rate of Audio Coding
- Error Collection and Interleave
- Guard Interval and Delay Profile
- Carrier Modulation





Muito Obrigado!

Contact: btd_i@ml.soumu.go.jp