GEMNET DVB-T and ISDB-T Comparative Test Results

October 10, 2008

Rembrandt Hotel

Quezon City

About GEMNET

- GEMNET or Global Expansion Media Network is the broadcast facility of the Iglesia ni Cristo (Church of Christ).
- GEMNET houses a number of studios and non-linear edit stations in our Quezon City facility.
- We also have a studio and post-editing facility in Daly City, California which contribute foreign contents to our channels.
- We have bureaus in major cities in the Philippines and in more than 20 locations around the world.

About GEMNET

- Our Master Control System provides transmission facilities for 4 TV channels:
  - GEM TV – local channel being aired in more than 300 cable headends nationwide.
  - GEM Network – international channel aired in DirecTV, a mainstream DTH system in the US.
  - INC Channel – cable channel being aired in SkyCable, Home and Global Destiny.
  - Net 25 – affiliate commercial channel being aired in more than 500 cable headends nationwide, in DTH in the Middle East and parts of Europe and Asia, and in a number of cable and IPTV headends in Thailand, Hong Kong and Guam.
- 5th channel is the GEMNET ISDB-T trial signal.

Digital TV Project Status

- GEM NET have finished actual DVB-T test transmission and is one of a number of Philippine networks who conducted such trials.
- GEMNET is currently conducting ISDB-T test transmission.
- GEM NET is getting ready for HD with the purchase of HD equipment and cameras - Panasonic HVX200, HPX500 and HPX3000, and Sony EX series to name a few.
- Affiliate station Net 25 have started production of a travel and history show (Landmarks) in HD and is in the process of transitioning other programs to HD.
- New Era University, the school owned by the Church, is setting up a Digital Lab. The purpose of this facility is to become a center for research on broadcast and communications, with emphasis on Digital TV technology.

Objective and overview of tests conducted

- GEMNET secured a digital TV trial permit from the NTC in early 2007 and conducted its trial broadcast using DVB-T from June to September 2007. The objective of the test is to validate the earlier studies on digital TV done by the organization's Digital TV Project Group.

- In 2nd half of 2007, Japan conducted a seminar and demonstration on ISDB-T. A side-by-side actual demonstration of DVB-T and ISDB-T was later conducted by TWG-2. The results of this demonstration prompted us to also conduct our own ISDB-T test, which started in January 2008.

Test parameters and equipment used

DVB-T:

- Transmitter power output = 400W
- Channel = 49
- Antenna pattern = narrow-cardiod with main lobe towards SW
- Antenna elevation = 620 ft. AMSL
- Antenn gain = 15dB
- Modulation = 16QAM, 8K, 1/16 Guard Interval, 3/4 FEC

Test parameters and equipment used

ISDB-T:

- Transmitter power output = 400W
- Channel = 49
- Antenna pattern = narrow-cardiod with main lobe towards SW
- Antenna elevation = 620 ft. AMSL
- Antenn gain = 15dB
- Modulation = 8K, 1/16 Guard Interval
  - HD: 64QAM, 3/4 FEC
  - One Seg: QPSK, 2/3 FEC

DVB-T transmitter and modulator

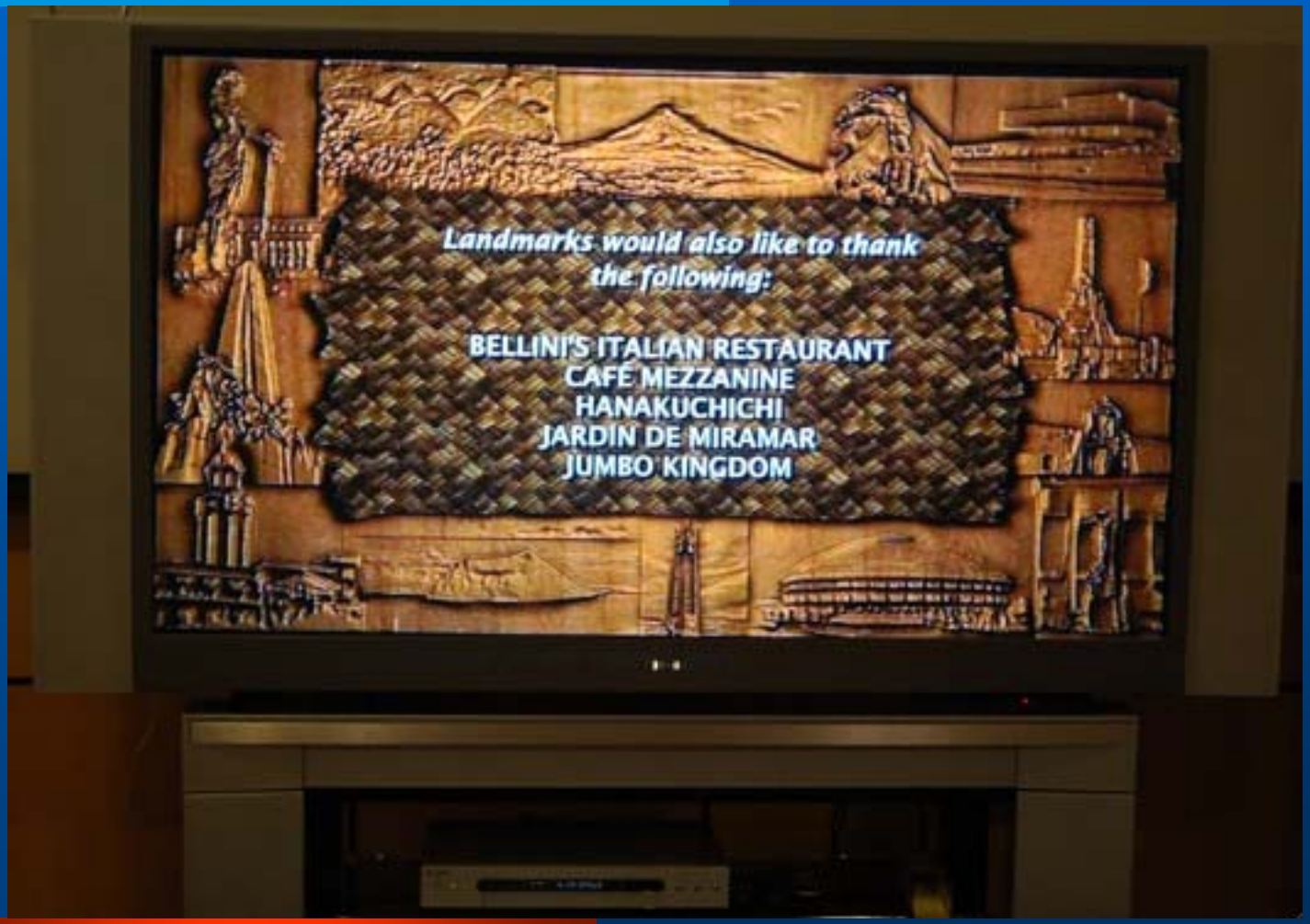
Set up of receive antenna

DVB-T reception

ISDB-T transmitter and modulator

Installation of ISDB-T Encoder and MUX

ISDB-T reception



DVB-T test transmission results

LOCATION	SUBJECTIVE EVALUATION INDOOR	SUBJECTIVE EVALUATION OUTDOOR	TRANSMISSION MODE	Aerial Distance to XMTR
1. Project 4, Q.C.	Video pixelization occurs	A/V signal is ok	8k,16QAM,3/4, 1/16	5.2 km
2 Taytay, Rizal	Video is totally pixelized	A/V signal is ok	8k,16QAM,3/4, 1/16	13.5 km
3 Pineda, Rizal	Bad or no Signal	A/V signal is ok, sig strength marginal	8k,16QAM,3/4, 1/16	10.7 km
4. Pineda, Rizal	Bad or no Signal	A/V signal is ok	8k, QPSK, 3/4, 1/8	10.7 km
5. Ibayo, Paranaque	Bad or no Signal	A/V signal is ok, sig strength marginal	8k,16QAM,3/4, 1/16	19.3 km
6. Ibayo, Paranaque	Bad or no Signal	A/V signal is ok	8k, QPSK, 3/4, 1/8	19.3 km
7. Pasay, MMS	Bad or no Signal	A/V signal is ok, sig strength marginal	8k,16QAM,3/4, 1/16	16.0 km
8. Pasay, MMS	Bad or no Signal	A/V signal is ok	8k, QPSK, 3/4, 1/8	16.0 km
9. Meycauyan, Bulacan	Bad or no Signal	A/V signal is ok, sig strength marginal	8k,16QAM,3/4, 1/16	14.4 km
10. Meycauyan, Bulacan	Bad or no Signal	A/V signal is ok	8k, QPSK, 3/4, 1/8	14.4 km
11. Marilao, Bulacan	Bad or no Signal	A/V signal is ok	8k,16QAM,3/4,1/8	18.0 km
12. Malinta, MMN	Bad or no Signal	A/V signal is ok	8k,16QAM,3/4, 1/8	11.9 km

It should be noted that at some locations where we obtained poor signal, we changed modulation from 16QAM to QPSK to improve reception. But this is at the expense of the data payload.

ISDB-T test transmission results

LOCATION	SUBJECTIVE EVALUATION INDOOR	SUBJECTIVE EVALUATION OUTDOOR	AERIAL DISTANCE TO TRANSMITTER
1. Congressional Ave.	HD & 1 SEG OK	HD & 1 SEG OK	4 km
2. Bagobantay Locale	HD & 1 SEG OK	HD & 1 SEG OK	3.8 km
3. Robinson Mall Monumento	HD marginal, 1 SEG OK	HD & 1 SEG OK	8.2 km
4. Malabon INC Chapel	HD no Signal, 1 SEG marginal	HD & 1 SEG OK	11.2 km
5. Magsaysay INC Chapel, Manila	HD no Signal, 1 SEG marginal	HD & 1 SEG OK	11.5 km
6. Tayuman st. Manila	HD no Signal, 1 SEG marginal	HD & 1 SEG OK	11 km
7. Pritil Tondo Manila	HD no Signal, 1 SEG marginal	HD & 1 SEG OK	11.4 km
8. Malinta Mc Arthur Highway	HD marginal, 1 SEG OK	HD & 1 SEG OK	9 km
9. Valenzuela Mc Arthur Hiway	HD marginal, 1 SEG OK	HD & 1 SEG OK	8.5 km
10. Meycauyan Bulacan	HD marginal, 1 SEG OK	HD & 1 SEG OK	12 km
11. SM Marilao	HD marginal, 1 SEG OK	HD & 1 SEG OK	13 km
12. Rembrandt Hotel	HD & 1 SEG OK	HD & 1 SEG OK	3.8 km
13. Tomas Morato Ave.	HD & 1 SEG OK	HD & 1 SEG OK	4.2 km
14. Greenhills Shopping Mall	HD no Signal, 1 SEG marginal	HD marginal, 1 SEG OK	7 km
15. SM Makati	No Signal	HD marginal, 1 SEG marginal	12.8 km
16. San Miguel Ave. Ortigas	HD marginal, 1 SEG OK	HD & 1 SEG OK	8.5 km
17. EDSA Mandaluyong	HD marginal, 1 SEG OK	HD & 1 SEG OK	10 km
18. EDSA Buendia	HD no Signal, 1 SEG marginal	HD & 1 SEG OK	12 km
19. EDSA Magallanes	HD no Signal, 1 SEG marginal	HD & 1 SEG OK	14 km
20. South Superhighway Bicutan	HD no Signal, 1 SEG marginal	HD & 1 SEG OK	19 km
21. South SuperHighway Alabang	HD no Signal, 1 SEG marginal	HD marginal, 1 SEG marginal	28 km
22. Shell Station(Susana Heights)	HD no Signal, 1 SEG marginal	HD no Signal, 1 SEG marginal	31 km

Summary of Results and Comparison

Distance from Transmitter	DVB-T	ISDB-T HD	ISDB-T ONE SEG
5 km	Audio/ Video OK	Audio/ Video OK	Audio/ Video OK
10 km	Audio/ Video OK	Audio/ Video OK	Audio/ Video OK
15 km	Pixelized at some locations	Pixelized at some locations	Audio/ Video OK
20 km	Pixelized at most locations	Pixelized at most locations	Pixelized at some locations
25 km	No Signal	No Signal	Pixelized at most locations
30 km	No Signal	No Signal	No Signal

Observation

- It should be noted that the same RF system (transmitter to antenna) were used in both propagation tests done. The only difference is in the modulators used. As per the summarized results, it can be concluded that there is no very significant difference between the two standards when it comes to fixed reception. But it can be said that ISDB-T is more superior because 64QAM was used in the modulation compared to 16QAM in DVB-T. 16QAM should have provided better signal coverage but it did not.
- It should also be noted that the ONE SEG feature of ISDB-T provided additional signal coverage to mobile and portable receivers. QPSK was used in the modulation providing a more robust signal than those available from 16QAM or 64QAM.
- In the tests conducted by TWG-2, almost the same results were obtained. 16QAM was used for DVB-T while 64QAM for ISDB-T. This not an apple-to-apple comparison but the supposedly more robust signal in using 16QAM for DVB-T was not observed.

End of Presentation

Thank you!