Initial Operation Results of the KOMAC 100MeV Proton Linac

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1. Introduction

A 100-MeV proton linac of the Korea multi-purpose accelerator complex (KOMAC) was installed and commissioned in 2013. The KOMAC accelerator facility has a 100-MeV proton linac, five beam lines for 20-MeV beam utilization, and another five beam lines for 100-MeV beam utilization [1]. The 100-MeV linac consists of a 50-keV proton injector based on a microwave ion source, a 3-MeV RFQ with a four-vane structure, and a 100-MeV DTL [2-3]. The KOMAC started to provide a proton beam to users on July 2013. A 20-MeV beam line and a 100-MeV beam line have been operated for beam service during the first year. In 2013, the proton linac had been operated for more than 2200 hours and beam service time was 432 hours approximately. The accumulated downtime during the first year in 2013 is 94.7 hours and there were some faults at utilities, high voltage modulators, and RF components.

2. Accelerator Operation

The specifications of the KOMAC 100MeV linac are summarized in the followings.

- 50-keV Injector
  (Microwave ion source and LEBT)
- 3-MeV RFQ (4-vane type)
- 20 & 100-MeV DTL
- RF frequency : 350-MHz
- Beam extractions at 20 or 100-MeV
- Five beam-lines for 20 & 100-MeV
- Peak beam current : 20 mA
- Max. beam duty
  : 24% at 20-MeV, 8% at 100-MeV
- Average beam current : 0.1 ~ 1.6 mA
- Pulse length : 0.1 ~ 1.3 ms
- Max. repetition rate : 60 Hz
- Max. average beam power : 160 kW

The 100-MeV accelerator facility was installed and commissioned, and the The KOMAC started to provide a proton beam to users on July 2013. Figure 1 shows the 100-MeV linac installed in the tunnel and Figure 2 shows the beam lines for beam utilization. The accelerator facility has five beam lines for 20-MeV beam utilization, and another five beam lines for 100-MeV beam utilization. During the first year operation, a beam line for 20-MeV and a beam line for 100-MeV has been operated for beam service.

Figure 1: 100MeV proton linac

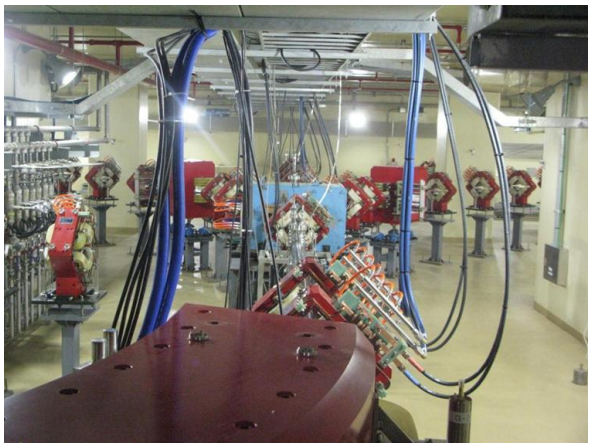

Figure 2: Beam lines for beam utilization

Figure 3 shows the accelerator operation history in 2013. Before beam service on July, the RF conditioning and beam commissioning had been performed. Beam service started on July and the KOMAC provided a proton beam to users for 15 weeks. The proton linac had been operated for more than 2200 hours and beam service time was 432 hours approximately.

3. Downtime

There were some faults during the accelerator operation of beam service. Figure 4 shows the downtime statistics in 2013 and Figure 5 shows the detailed downtime at each system. Accumulated downtime was 94.7 hours and there were some faults at modulators, RF systems, utilities including cooling system, electrical power, radiation shielding door system.

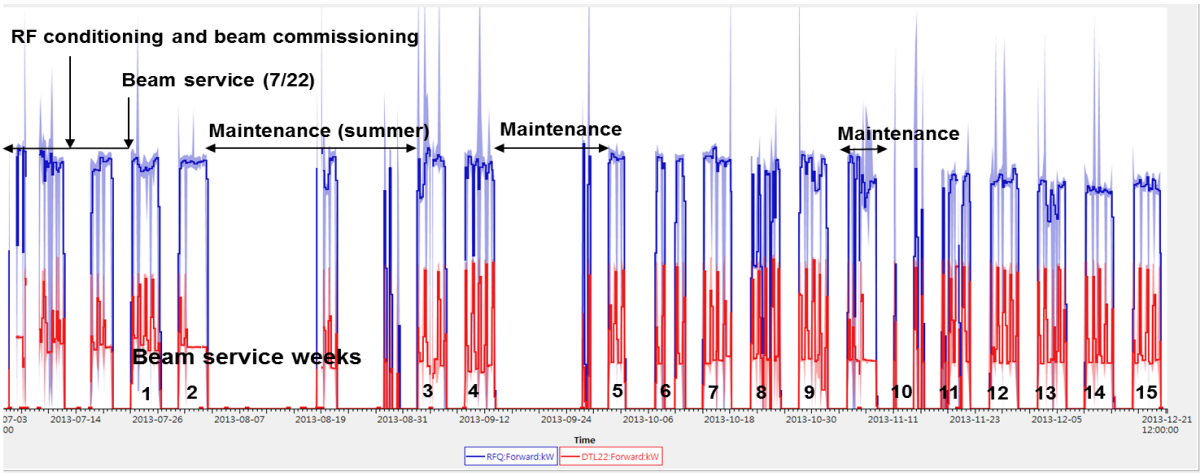

Figure 3: Accelerator operation history in 2013

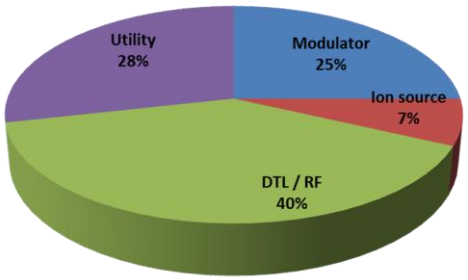

Figure 4: Downtime statistics in 2013

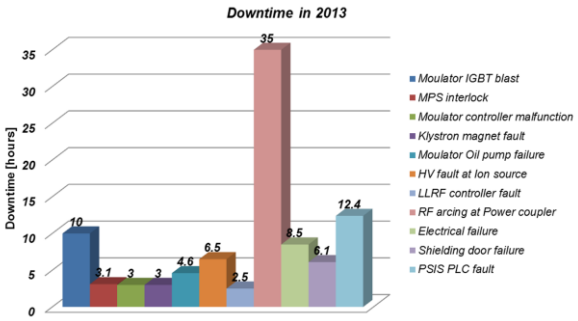

Figure 5: Detailed downtime at each system

4. Operation Plan

The Figure 6 shows the plan for beam power upgrade and beam-line construction. The plan for beam power and operation time in 2014 is 10 kW and 2500 hours respectively. Beam power will reach maximum beam power of the 100MeV linac in 2021. The construction of beam-lines and target rooms will go with beam power upgrade as shown in Figure 6.

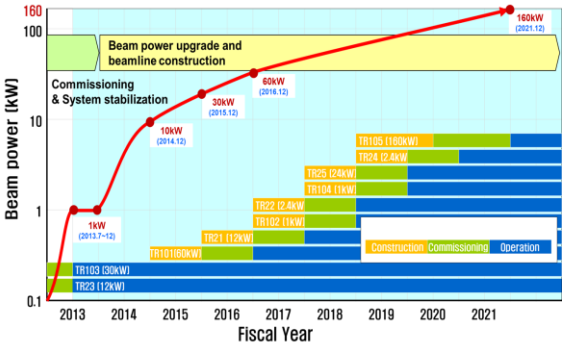

Figure 6: Plan for beam power upgrade and beam-line construction

5. Conclusions

The KOMAC started to provide a proton beam to users on July 2013. The proton linac had been operated for more than 2200 hours and beam service time was 432 hours approximately. Accumulated downtime was 94.7 hours and availability was 82 %. The plan for beam power and operation time in 2014 is 10 kW and 2500 hours respectively.

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REFERENCES

[1] Y. S. Cho, et al.,"Status of 100-MeV Proton Linac Development for PEFP", Proceeding of the 2011 International Particle Accelerator Conference, pp.2742-2744.

[2] H. J. Kwon, et al., "Improvement of the 20MeV Proton Accelerator at KAERI", Proceeding of the 2013 International Particle Accelerator Conference, pp.3466-3468.

[3] Kyung-Tae Seol, Hyeok-Jung Kwon, Han-Sung Kim, Young-Gi Song, and Yong-Sub Cho, J. Korean Phys. Soc. **59**, 627 (2011).