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## ABSTRACT

Injecting beams in CERN facilities is subject to the CERN safety rules. It is for this reason that the Beam Permit approval procedure was improved by moving away from a paper-based workflow to a digital form. For each facility, the Beam Permits are signed by the various responsible specialists (Access systems, safety equipment, radiation protection, etc...). To achieve this, CERN's official Engineering Data Management System (EDMS) is used. The functionality of EDMS was extended to accommodate the additional requirements, whilst keeping a user-friendly web interface. In addition, a new webpage within the CERN OP-webtools site was created with the purpose of providing a visual overview of the Beam Permit status for each facility. This new system is used in the CERN Control Centre (CCC) and it allows the Operations team and all people involved in the signature process to follow the Beam Permit status in a more intuitive, efficient and safer way.

## BEAM PERMITS IN EDMS

At the beginning of 2015, the CERN Beams Operations group (BE-OP) decided to move Safety Permits from paper (Fig.1) to a digital system. The Beams Departmental Safety Officers (BE DSO) in agreement with the BE-OP group leader decided eventually to use EDMS as the new tool for Safety Permits management.

BEAM PERMIT 2017		ZONE: PS-RING
<p><i>Please read any exceptions or additional remarks as consent with your signature in EDMS:</i></p> <p>1. <b>All shutdown works complete:</b> The Machine Facility Coordinator attests that all shutdown works have ended including in outside areas. The integrity of the infrastructure is preserved, in particular all shielding blocks and ventilation doors are in place to higher best knowledge. Any new or modified shielding has been reported to and validated by the BE-DSO.</p> <p>2. <b>Recommissioning phase complete:</b> The Recommissioning Coordinator attests that the integrity of the infrastructure is preserved, in particular all shielding blocks, fences and ventilation doors, is preserved. Any new or modified shielding has been reported to and validated by the BE-DSO.</p> <p>3. <b>Access system functionality:</b> The access system for the machine is fully operational. All safety and control functions are operational. Any non-compliance, bypass or error of EDMS must be reported, repaired, as comment associated to the DSO's signature. The electronic signature of the control software (if applicable) of the access system will also be entered in the EDMS comment.</p> <p>4. <b>BE DSO tests:</b> The purpose of the DSO tests is to validate the correct operation of the safety functions of the access system and of all "PS". The DSO test is done according to procedure (CERN 10388).</p> <p>5. <b>Radiation protection:</b> The RF responsible persons attest that a visual inspection of radiation shielding has been performed when and where appropriate. Radiation monitoring system (measurements, alarm functions and alarm management) is operational. Limitations on beam operation can be expressed in accordance with reduced shielding.</p> <p>6. <b>Patrol:</b> The permit is granted according to BE-OP patrol procedure. EDMS 107388 (S), EDMS 107407 (S), EDMS 107409 (S), EDMS 107779 and EDMS 107780. This patrol includes checking the cleaning and tidiness of the areas, the integrity of access barriers, radiation shielding, and ventilation doors, but first of all the presence of any person in the zone.</p> <p>7. <b>Final Authorisation for Beam:</b> At this point the machine is operational for beam. The BE-OP group leader (in the relevant CSAP chairman, or the project leader for commissioning machines) accepts the machine for operation within the range of the restrictions that have been made in writing.</p>		<p><b>Person and Group for signature:</b></p> <p>Machine Facility Coordinator</p> <p>Group: EN-ACE</p> <p>Recommissioning Coordinator</p> <p>Group: BE-OP</p> <p>Access system responsible person</p> <p>Group: BE-ICE-AC</p> <p>DSO, DSO, DSO or DSO</p> <p>Group: BE-ADP-SU</p> <p>RF-AS Section Leader or designee</p> <p>Group: HSE-FP</p> <p>Patrol leader or Shift Leader on duty in CCC</p> <p>Group: BE-OP</p> <p>BE-OP Group Leader or deputy</p> <p>Group: BE-OP</p>
<p><b>Beam Permit suspension by any qualified person:</b></p> <p>Reason for suspension (including possible reference documents) will be mentioned by the requestor, when changing the status to "Suspended", as a comment in EDMS.</p>	<p><b>Beam Permit cancellation:</b></p> <p>Action undertaken to resume the safe situation will be given as a comment on the EDMS Beam Permit.</p> <p>The cancellation will be approved by the requestor of the suspension and the final sponsor of the Beam Permit.</p>	<p><b>Beam Permit cancellation:</b></p> <p>The reason for cancellation (during the turn or at the end of the turn) will be given as a comment when changing the status of the Beam Permit to "Cancelled" in EDMS.</p> <p>Cancelled Beam Permit (Cancelled in EDMS)</p>

Fig. 1: Beam Permit Template (PS Ring zone)

First documents were based on the basic approbation process used in EDMS (old method) where documents went through three steps ("In Work", "Engineering Check" and "Released"). All signatures were inserted by adding comments while the documents were in "Engineering Check" status. Once the facilities were approved by all signatories, the documents were moved to "Released" and the Safety Permits were approved.

At the beginning of 2016, a new prototype was presented with the aim to improve the process and adapt EDMS to the Safety Permits needs (Fig.2). This new prototype contains a workflow that follows the logic of the Safety Permits process with descriptive names for each status, a new access right structure for the various stages of the process and a new way to sign off foreseen activities (not available in EDMS at that moment).

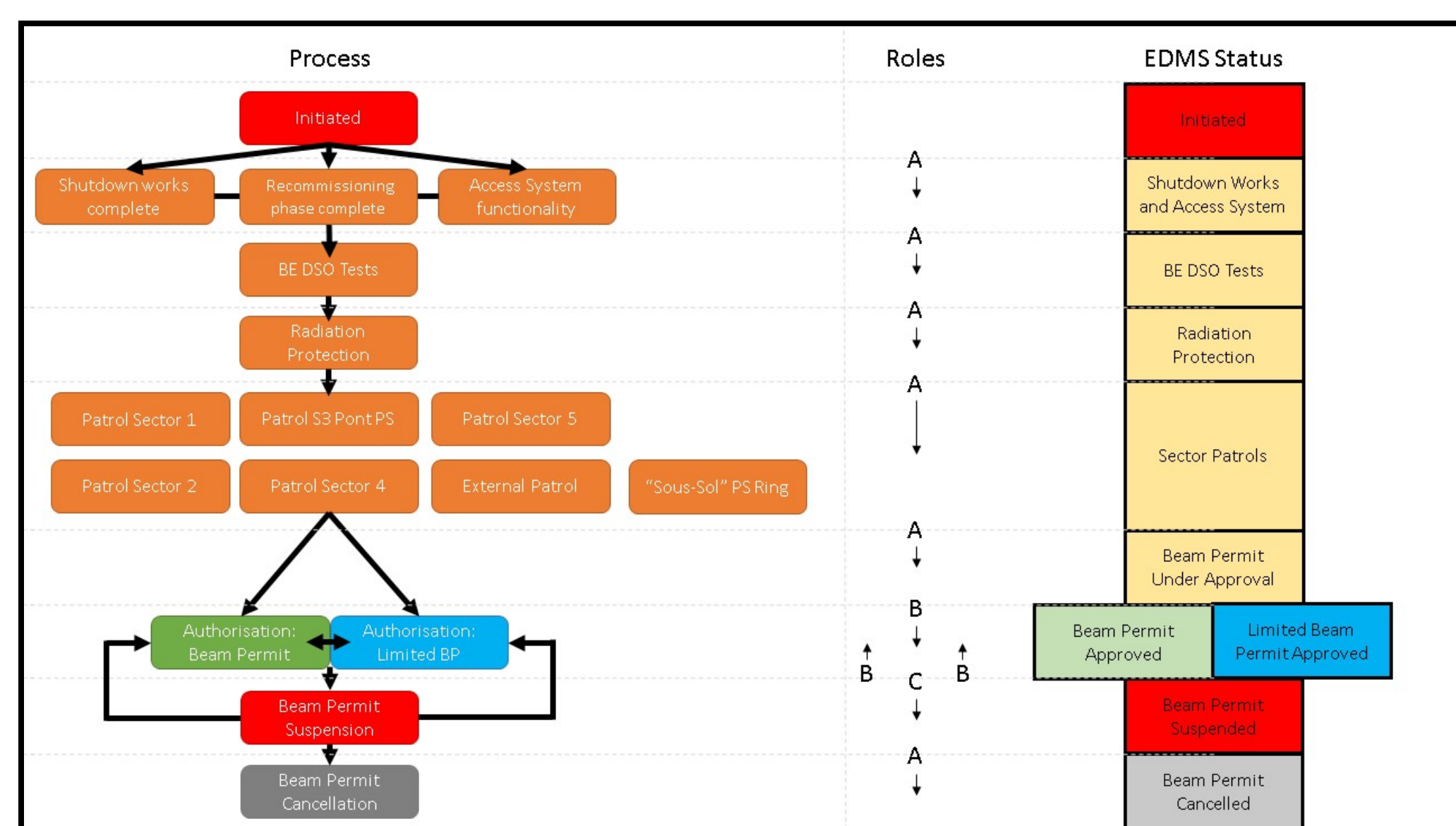


Fig. 2: Beam Permit Procedure (PS Ring zone)

## BEAM PERMITS IN OP-WEBTOOLS

Once first Beam Permits were using this new method in EDMS (Fig.3), BE-OP requested the creation of a new tool in the existing OP-Webtools portal (used already by the Operations team) with the aim to have a main view of all Beam Permits from a fix display installed in the PS Complex island of the CERN Control Centre (Fig.4).

Following the development of the new tool, operators have the means to acquire the status of each Beam Permit in an efficient way, reducing the time needed to introduce Beam in each facility and reducing the risk of misunderstandings.

## RESULTS

Twelve beam permits and five hardware permits of the PS Complex have been in operation since 2017 run, using the new system with very good results. The process has been much clearer for specialists and operators and it has been easier for other CERN staff to follow the workflow for each facility.

Some issues arose during the testing phase and thanks to the continued effort for the improvement of EDMS, all problems were solved before moving it from the test phase to production.

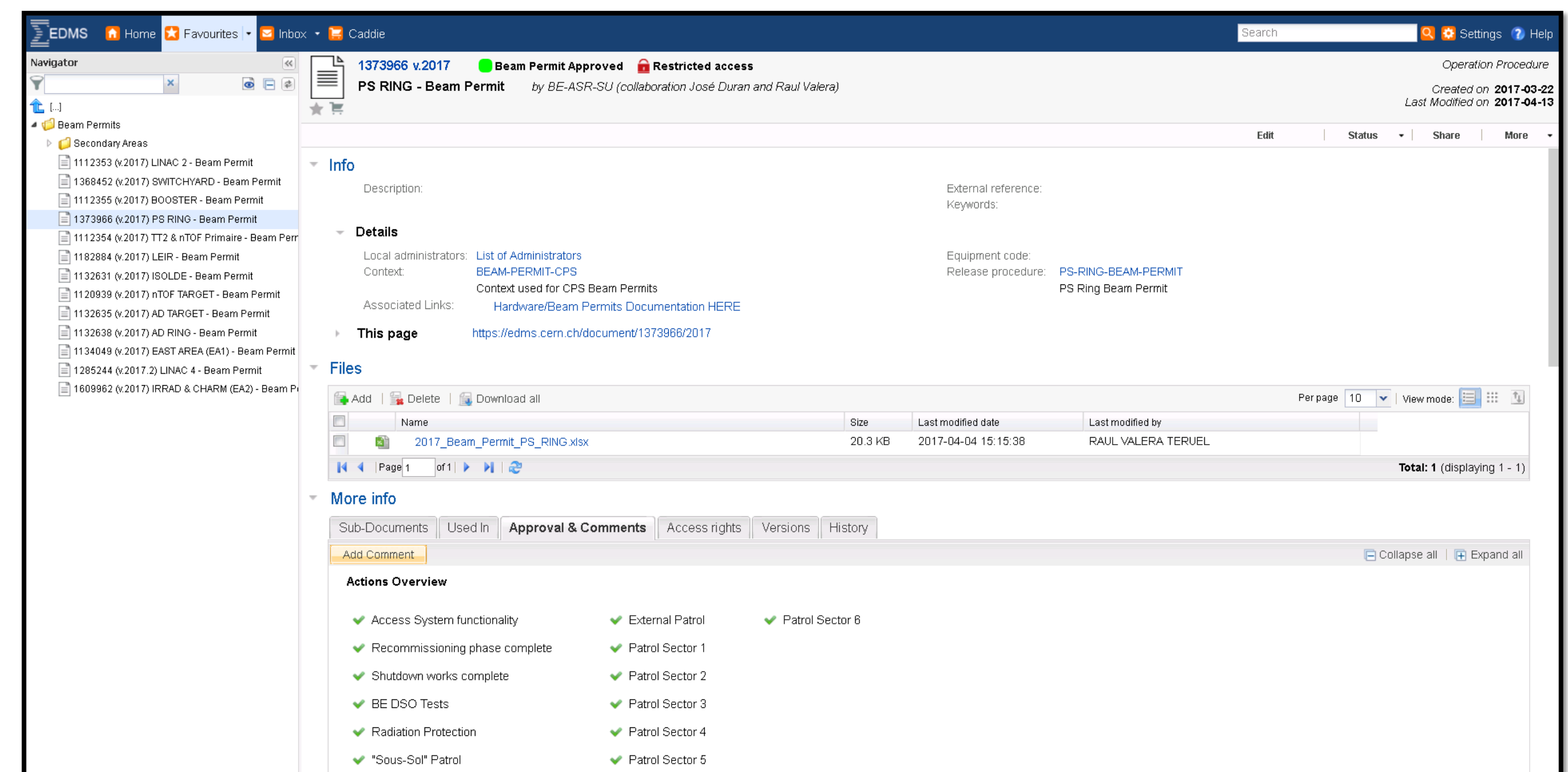


Fig. 3: EDMS Document (PS Ring zone)

In summer 2017, the new experiment BASE in the Antiproton Decelerator facility started using a similar workflow adapted to secondary beam areas (areas receiving secondary particles as protons collide with a fix target with the aim to produce antiprotons that are finally sent to the experiment) with positive feedback.

## PROJECT STATUS

Existing Beam Permits of the PS Complex will keep the same workflow and just some minor modifications will be made such as adding some "Actions" (signatures) to some Beam Permits and renaming one of the statuses for the next year.

In terms of software, some new features have been requested by BE-OP to EN-ACE-EDM. It includes visual improvements of EDMS, new tools to manage Beam Permits and other features like a new automatic notification system that will save time for future Beam Permits implementation, configuration and maintenance.

There are also some improvements that are being done in the OP-Webtools side with the aim to give more information about Beam Permits to operators while keeping the fast and simple overview of the Beam Permits.

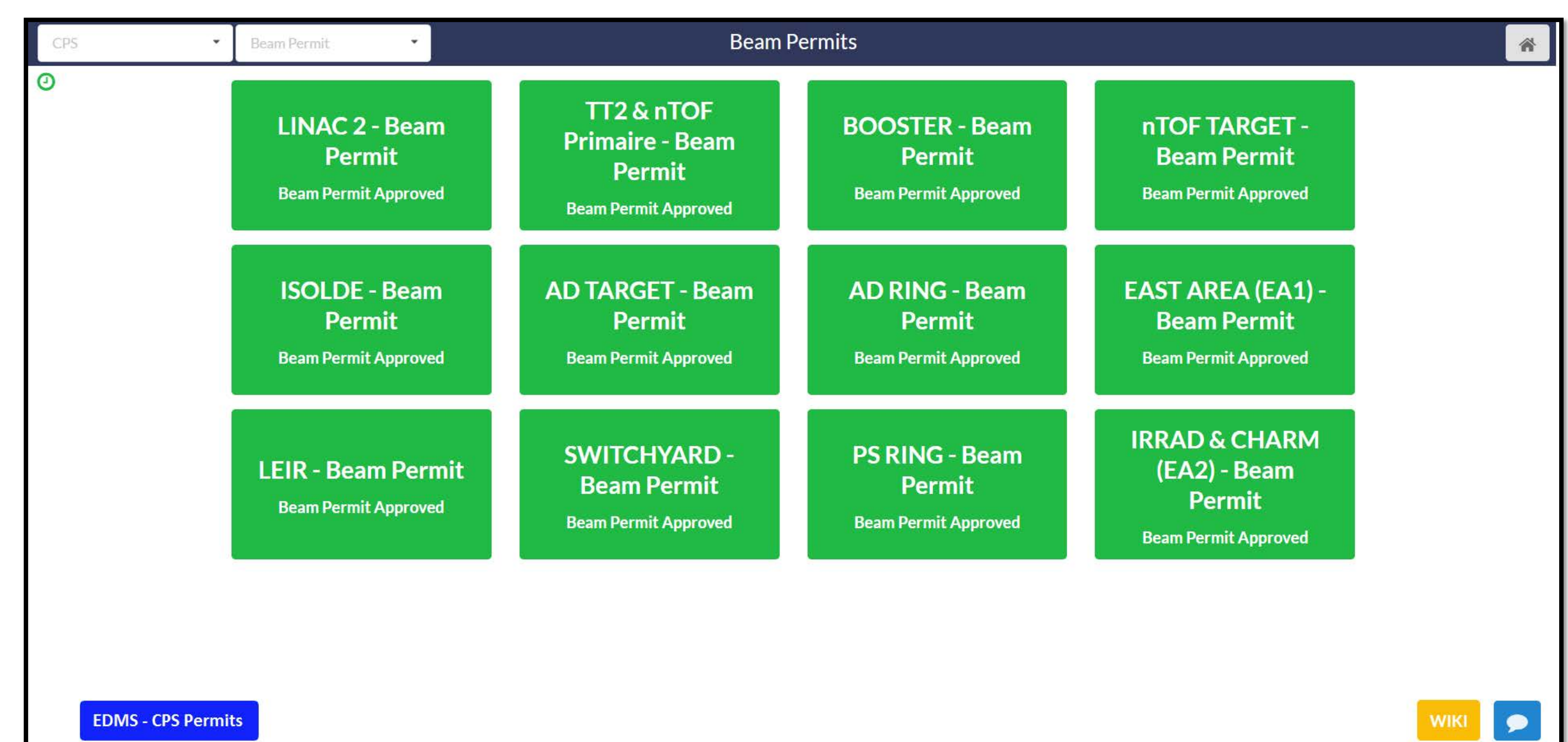


Fig. 4: Beam Permits webpage in OP-Webtools

A wikipage with information related to this new method is available. It is used by CERN staff members as a guide and it helps them to be informed about new improvements on the system.

## CONCLUSIONS

After the first test using this new method for the PS Complex, we have learnt not just about the new process itself with all advantages but also about the way to organize our planning for next years.

In the near future, other Safety Permits will be implemented for the Super Proton Synchrotron (SPS), the Large Hadron Collider (LHC) and the experimental areas linked to them (they use the old EDMS method). The rest of the facilities of the PS Complex will integrate the new process. New facilities such as the new Linear Accelerator 4 (LINAC 4) will use the new process from the start.

New features and improvements will be developed in EDMS and the Beam Permits webpage. A future implementation into the CCC Access Systems will be studied.

For the 2018 run, we are working on the improvement of the system thanks to a continued communication among the BE-OP group, the BE DSO and the EN-ACE-EDM section with the aim to cover all aspects (safety, infrastructure, operation...) for each current and future facility using the new method and the possibility to improve and adapt each system to the new needs.

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